THE ENGINEERING CONSTRUCTION WEEKLY

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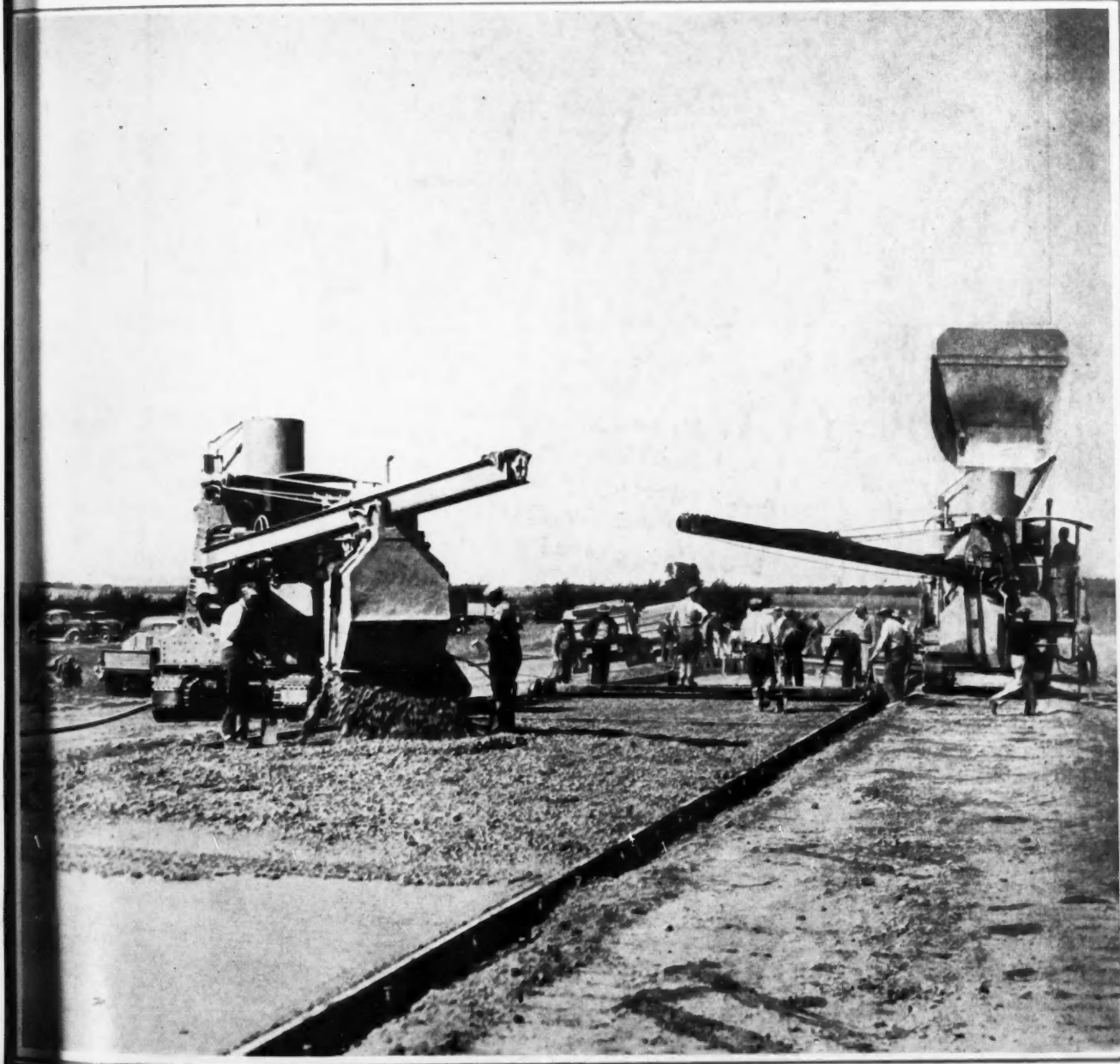
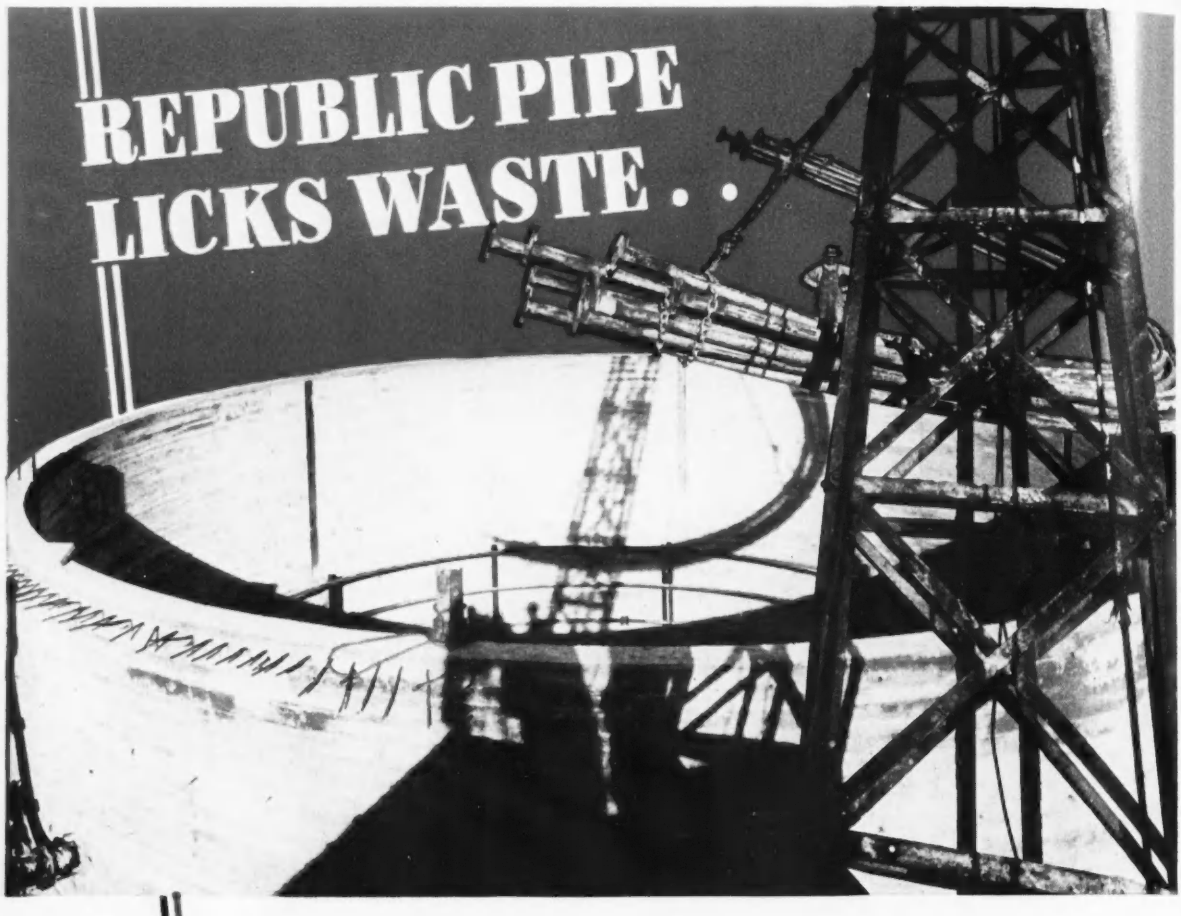


BRIDGES · IRRIGATION · FLOOD CONTROL · FOUNDATIONS · DAMS · HIGHWAYS · WATERWORKS · STREETS · SEWERS

REPUBLIC PIPE LICKS WASTE . . .



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· ENGINEERING NEWS-RECORD ·

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VOL. 120 *MARCH 31, 1938* No. 13

THIS WEEK AND NEXT

TWO MIXERS, working side by side and each laying one lane of a two-lane road, paved 1,500 to 1,800 ft. daily on an Indiana highway job last fall. The mixers used independent fleets of trucks.

Need for routine study of seepage from dams in the Los Angeles water supply system led laboratory men to develop simplified methods and equipment for making filtrate analyses.

The collapse of an apartment house in New York City last summer killed 18 workmen and raised question as to the adequacy of the bracing used for a steel bent that supported a penthouse. Since design methods for such bracing are not well understood an article in this issue that presents two possible methods of analysis for slender compression members requiring lateral support is timely and important.

Through the middle of Council Bluffs, Iowa, a narrow, deep channel, ordinarily almost dry, ran its course. Frequently rainfalls forced the stream out of its banks and caused sufficient damage to justify the expense of controlling it—a job described on page 471.

Research into railroad track problems is not to stop despite financial difficulties of the railroads. This is the outstanding news in the report of the A.R.E.A. meeting on p. 478.

NEXT WEEK. Gilbertsville Dam has been much in the limelight recently due to opposition in Congress to granting money to the TVA for a start on this costly flood-control project. In next week's issue will be published an authoritative article telling what the project is and why it is proposed.

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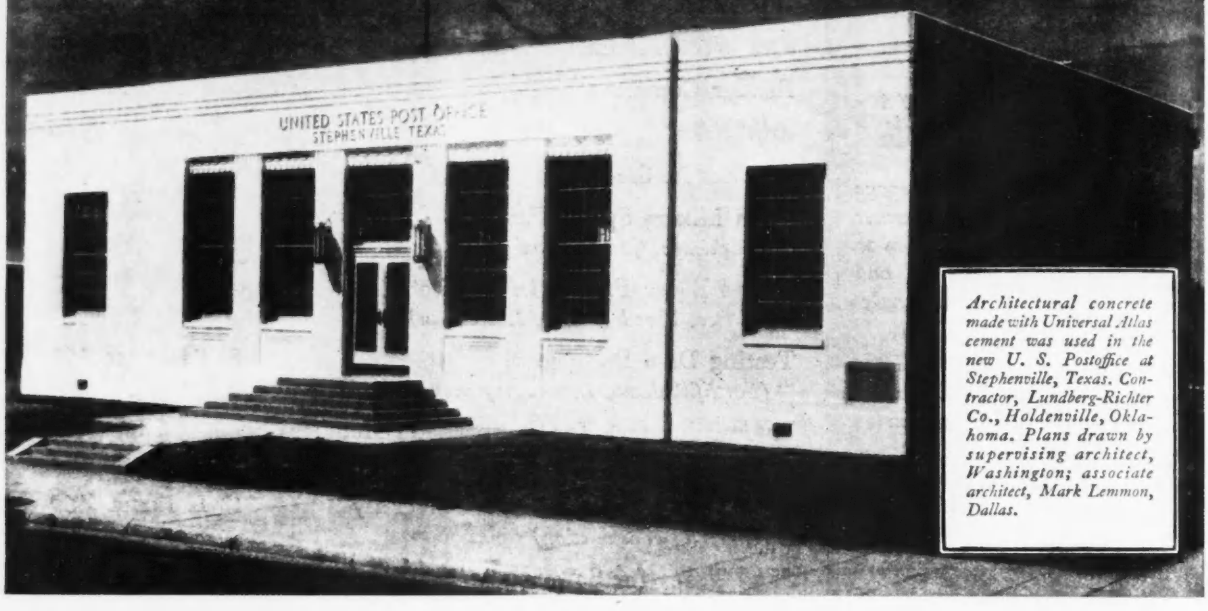
THE COVER PICTURE. Two mixers were used to speed up paving operations in Indiana. See page 463. *ENR Staff Photo*

Number of copies of this issue printed: 33,031

Here's a *BEAUTY HINT* for Construction!



Architectural concrete made with Universal Atlas cement was used in the new U. S. Postoffice at Stephenville, Texas. Contractor, Lundberg-Richter Co., Holdenville, Oklahoma. Plans drawn by supervising architect, Washington; associate architect, Mark Lemmon, Dallas.

Architectural concrete made with Universal Atlas Cement leads the way to new beauty in construction, also assuring strength, durability, fire-safety—generally at substantial saving in cost

Starting in the West, the use of architectural concrete swept East rapidly—developed at the rate of one job (prior to 1935) to between five and six hundred jobs in 1937.

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THE WEEK'S EVENTS

New Planning Bill Is Introduced

New Mansfield bill would limit function of regional authorities to planning

A revised regional authorities bill limiting the function of the proposed seven regional authorities to planning for and advising existing construction agencies, was introduced into Congress March 25 by Representative Mansfield, chairman of the House committee on rivers and harbors. The seven regional bodies, without authority to construct projects, would be under the jurisdiction of a national board which would be essentially a continuation of the present National Resources Committee.

In its new form the bill proposes seven regional planning committees and a permanent National Resources Board. Each committee will be made up of a representative of each state in its region, appointed by the governor, and of representatives from each of the federal agencies operating in the region. Its chairman will be named by the President, will be paid $7,500 annually, and will be a member of the National Resources Board.

Besides the seven regional chairmen, the national board will contain one employee each from the departments of Agriculture, Interior and War (the latter to be an officer in the Corps of Engineers), and a chairman to be appointed by the President at $10,000 per year.

Specifically exempted from provisions of the bill are the Great Lakes and tidal waters along the various coasts. It is also specifically provided that construction and operation of projects dealt with under the new set-up will be handled by the usual agencies, as at present.

The new set-up, at Bonneville, whereby the operation of the dam and power plant is in the hands of the Corps of Engineers and the sale of powers in an Administrator, is extended to include Grand Coulee dam and any other federal dams which may later be constructed in that region.

The regional committees will study, analyze, and coordinate basic data relating to conservation projects in conjunction with interested federal and state agencies and prepare logical plans for development. The national board will receive these, combine them into a national plan, and submit recommendations, indicating the order of preference and priority, in an annual report to the President. He will, in turn, confer with department heads and

(*Continued on page 454*)

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Contractors Plead Guilty To Insurance Fraud

Eight lathing contractors of Brooklyn, N. Y., pleaded guilty March 23 to defrauding the state insurance fund and a number of insurance companies of about $21,000 in compensation insurance premiums. The cases, declared by state industrial Commissioner Andrews to be the first successful prosecutions for violation of this kind, involved the maintenance of duplicate or false books containing payroll figures much smaller than those actually paid employees.

The defendants were arrested Feb. 5 after an intensive investigation by the State Labor Department and the Kings County District Attorney of suspected employers engaged in the building trades. Widespread evidence of fraudulent practices in the building trades, particularly relating to the falsification of payroll records, was disclosed by the investigation, according to Commissioner Andrews.

MAJOR NEWS

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Merritt Road Design Is Approved

Investigator for Governor recommends minor changes in future bridge approaches

The Merritt Parkway in Connecticut was found to be "an excellent piece of construction" by Charles J. Bennett, who investigated the parkway at the request of Governor Cross. Mr. Bennett, a consulting engineer, was Connecticut state highway commissioner from 1913 to 1923.

Design of the parkway, particularly of the approaches and bridges at intersections, was severely attacked by public works commissioner Hurley and defended by highway commissioner Macdonald (*ENR*, March 10, 1938, p. 352). In an attempt to settle the controversy, Governor Cross engaged Mr. Bennett to investigate all points at issue.

Bridges found safe

"With reference to the bridges," Mr. Bennett reported, "conditions are not seriously dangerous . . . There is no probability of a series of continuous accidents due to masonry construction. There will be vital need for careful study of traffic regulations, guidance and control. Occasional parking spaces and turnouts will probably be needed. Consideration should be given to patrol and policing.

The Merritt Parkway, the report points out, has a 300-ft. right-of-way, with present construction on the north side of this strip. The standard cross section consists of two 26-ft. concrete roadways separated by a 21-ft. center strip except at bridges. Reflecting glass buttons are recessed in the top of the curb at intervals of 20 to 50 ft., outlining the edge of the road at night.

Wider at bridges

At bridges, the center strip is narrowed to 16 ft. The actual paved width of the bridges is about 3 ft. greater than at the typical cross section. There are two exceptions, among the 50 bridges already built, to this practice. At New Cannan, an electrified railroad is carried over the parkway on a two-span bridge which places a concrete

(*Continued on page 452*)

Surveying Teachers Oppose Inch Change

Fifty educators meet in Troy to discuss plane coordinates and photogrammetry

Opposition to a bill in Congress which would change the length of the United States Standard inch was registered by some fifty surveying teachers who attended the northeastern regional surveying teachers conference of the Society for the Promotion of Engineering Education at Troy, N. Y., March 24-26. Principal subjects of papers at the meeting were plane coordinates and photogrammetry.

In connection with discussion of state plane coordinate systems, Prof. Phillip Kissam of Princeton University tossed what he termed a "bomb-shell" into the meeting by calling attention to a bill now in Congress (H.R. 8974) which proposes to change the length of the United States inch by revising its relation to the standard meter. The change would amount to only one part in 500,000, but nevertheless would make necessary the recomputation of all state plane coordinates in existence. Such an undertaking would entail so much expense and time that it would set back plane coordinate systems to a position from which recovery would be a matter of many years, or even impossible, according to Prof. Kissam.

The conference recommended that the bill be not passed without due consideration by the proper committees of the American Society of Civil Engineers, the American Geophysical Union and the Federal Board of Surveys and Maps.

Prof. Kissam followed his discussion of the proposed change in the inch by a paper on state plane coordinates, their advantages, and suggestions for establishing them. To date, three state legislatures, Pennsylvania, New Jersey and New York, have passed plane-coordinate enabling acts, and many others are considering the legislation.

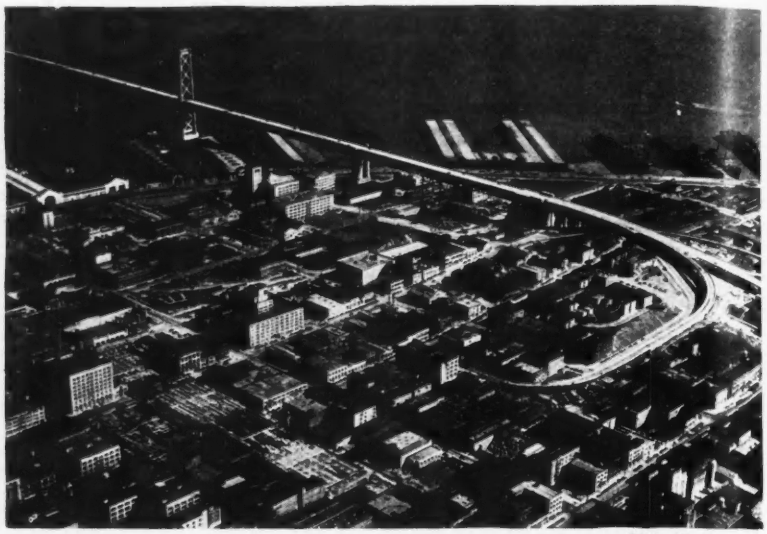
Wayne D. Heydecker, director of state planning in New York, covered two points, the importance of accurate maps in planning operations, and the division's program with respect to mapping in New York. He outlined problems met in Westchester County in 1933, when an attempt was made to coordinate its political subdivision maps for assembly of a tax map. It was a jigsaw puzzle which didn't fit, so it was necessary to establish a county control by triangulation. He then carried the idea of this need for control to the whole state and pointed to the place of plane coordinates. It is his belief that given a proper control, aerial mapping can be of very great economy.

Prof. A. H. Holt of Worcester Polytechnic Institute presented arguments for both geodetic control system and geodetic-plane coordinate systems, and pointed out difficulties in getting any kind of control included in land descriptions as they exist.

In the meeting on photogrammetry, Prof. H. O. Sharp of Rensselaer outlined methods of teaching photogrammetry, laying stress on minimum equipment for teaching, and on problems which the instructor can use in this work. Prof. Earl Church of Syracuse University commented further on aerial photographic practice, and Charles M. Emerson, of Aerial Explorations told how aerial maps can be used to increase tax revenue by ferreting out pieces of property that always have gone unassessed because no assessor had time to find them.

Fairchild Aerial Camera Corp. was represented by R. G. Sanders, who illustrated many machines used in Europe for close stereoscopic plotting of aerial maps.

One-half day of the meeting was given over to a trip through the W. & L. E. Gurley instrument factory in Troy, after which the group had dinner at the plant as Gurley's guests. Prof. Warren C. Taylor, of Union College, Schenectady, a member of the committee on arrangements, gave a rather complete report of activities of the conference last summer, 14 members of which were at Troy.



Wide World Photos

TERMINAL FOR BRIDGE RAILROAD

TERMINAL for the San Francisco-Oakland Bay Bridge electric railway is revealed under construction in the foreground above. Trains will cross from the bridge to the terminal building over a viaduct connected with the lower deck of the span and entering the building at a level above the streets. Surface lines for the city serve platforms at street grade.

Merritt Parkway Design Is Approved

(*Continued from page 451*)

center pier between two 26-ft. paver strips. Under a bridge in Norwalk, the two lanes are separated by a center wall. The report recommends that in these two instances special markings and lighting be used to indicate the variation from standard construction.

Recommendations

As regards bridges still to be built, Mr. Bennett recommends that, at the Westport bridge, contraction of the highway begin farther back than had originally been planned, since the road is on a grade at this point. He also recommends that three overpass bridges on which contracts have been let be widened 10 ft. The suggested changes will not require calling for new bids.

In a statement released together with the report, Governor Cross said that "for the sake of appearance and ease of driving, I have suggested a re-study of the converging approaches to the bridges. This I understand the highway commissioner is now doing. . . In the case of bridges already built, the lanes begin to converge some 400 or 500 ft. from the masonry. It would be better to start the converging of the lanes 1,000 ft. or more away. I have recommended that this practice be adopted in all bridges yet to be built and in the existing bridges wherever feasible."

THE CURRENT TREND

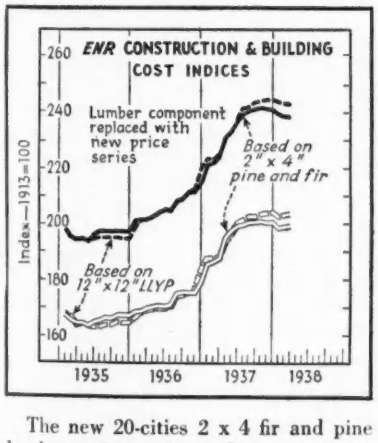
This week's news of contract volume and construction cost factors

ENR Cost Index Adjusted

New lumber prices series substituted for long leaf yellow pine timber price trend cost in index

The price trend of 12-in. x 12-in. long leaf yellow pine, heretofore used in computing the *Engineering News-Record* Construction Cost index, will be replaced in future computations by a composite 20-cities price average of 2-in. x 4-in. Douglas fir and Southern or local pine, S4S, carload lots. The weighting given to lumber in this index has been adjusted on the basis of 1936 averages, and on the difference in price level of the old and new lumber price series, so that the 1936 *ENR* Construction Cost index average will not be changed.

The lumber weighting thus changes from 600 bd. ft. of 12 x 12 LLYP to 1,088 bd. ft. of *ENR* 20-cities composite average pine and Douglas fir, 2 x 4 S4S. The cost index has been recomputed for an overlapping period of two years to show the month-by-month effect of this lumber price substitution. These new values are shown in the accompanying tables.



The new 20-cities 2 x 4 fir and pine lumber price series reflects an active market and gives a superior measure of national movement in lumber prices.

It happens that the only long-time lumber price records available are all based on long leaf yellow pine. In recent years, however, price quotations for 12 x 12 size in this species have not reflected an active market. This situation promises to become more acute as time goes on.

The increased sensitivity of this new lumber component is illustrated in the accompanying chart showing both the general construction cost index and the *ENR* building cost index. A drop of $4.38 in the nine months from June, 1937 to March, 1938 from the composite fir and pine price average of $36.47 results in a drop due to lumber alone in this period of almost 4 points in both the *ENR* construction and *ENR* building cost indices.

ENR Construction Cost Index, 1913 = 100
(Using 2x4 fir and pine lumber component)

	1935	1936	1937	1938
Jan.	198.22	201.23	221.20	239.62
Feb.	195.07	201.33	222.05	238.99
Mar.	194.41	201.63	224.75	238.79
Apr.	194.65	202.80	231.35	.....
May	193.96	204.05	233.45	.....
June	196.73	205.08	237.25	.....
July	197.43	204.80	239.90	.....
Aug.	197.45	208.48	240.65	.....
Sept.	197.30	208.88	241.62	.....
Oct.	197.50	211.53	241.90	.....
Nov.	197.35	211.50	241.40	.....
Dec.	197.20	215.70	241.05	.....
Aver.	**196.44**	**206.42**	**234.71**	.....

ENR Building Cost Index, 1913 = 100
(Using 2x4 fir and pine lumber component)

	1935	1936	1937	1938
Jan.	167.50	168.33	185.45	198.62
Feb.	165.75	168.43	186.55	198.99
Mar.	164.10	169.68	187.65	199.29
Apr.	164.40	170.00	194.95	.....
May	163.30	170.35	197.15	.....
June	164.85	170.18	199.20	.....
July	165.25	170.85	199.80	.....
Aug.	166.20	174.93	200.65	.....
Sept.	166.05	175.33	200.62	.....
Oct.	167.30	175.33	201.09	.....
Nov.	167.30	175.50	200.30	.....
Dec.	167.15	179.30	200.45	.....
Aver.	**165.76**	**172.35**	**196.15**	.....

Business Briefs

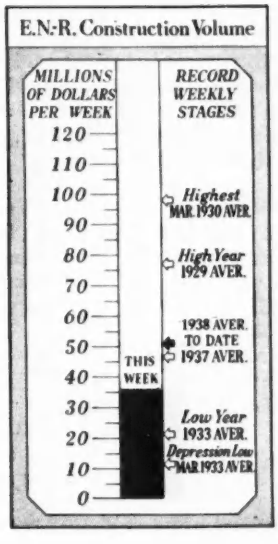
EMPLOYMENT IN THE PRODUCTION of six major construction materials stands at 46.7 for January, 1938, according to the Projects Division of the PWA. This compares with 52.6 in December, and 57.4 in January, 1937. Base 1923 to 1925=100.

INDEX OF SHIPMENTS of construction materials is 44.0 for January. This is 2 points above the preceding month, but 17 points below the corresponding 1937 month as reported by the Projects Division of the PWA. Base, 1929=100.

TERRA COTTA ORDERS for January, 1938, total 893 short tons, as reported by the Bureau of the Census. This is 22 per cent higher than orders reported in December, 1937, and 9 per cent higher than in January, 1937.

ASPHALT INSTITUTE reports consumption of asphalt in 1937 has exceeded 1936 by 1 per cent and has reached an all-time high, 17 per cent above the 1929 level. Asphalt use in "Farm-to-Market" road program is largely responsible for the gain.

FABRICATED STEEL PLATE orders for January, 1938, 23,422 short tons, are 15 per cent under December, 1937, and 43 per cent under orders for January, 1937, as reported by the Bureau of the Census.



THIS WEEK'S FIGURES

(Thousands of Dollars)

CONTRACTS

	Week Ending Apr. 1 1937	Mar. 24 1938	Mar. 31 1938
Federal	$3,139	$4,117	$2,822
State & Municipal	14,019	25,318	22,524
Total public.....	$17,158	$29,435	$25,346
Total private....	17,520	19,714	11,763
TOTALS	$34,678	$49,149	$37,109

Cumulative
1938 (13 weeks).....$658,785*
1937 (13 weeks).....$533,740

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works $25,000; industrial buildings, $40,000; other buildings, $150,000. * Revise.

NEW PRODUCTIVE CAPITAL

	Cumulative 1937 13 Wk.	1938 13 Wk.
NON-FEDERAL	$440,715	$371,053
State & mun. bonds.	161,472	201,019†
Corporate securities..	203,542	93,275
PWA loans, grants...	46,562	—2,497†
RFC loans	29,139	62,420
U.S.H.A. loans	.....	16,836
FEDERAL	.....	.....
TOTAL CAPITAL ...	$440,715	$371,053

† Represents transfer from federal to private investment financing through sale by RFC of PWA bonds.

Coast Flood Debris Being Cleared

Storage reservoirs found to be seriously choked with debris in post-flood survey

Three weeks after the flood, Los Angeles and the foothill cities are still digging out debris and mud which was left in streets, frontyards and farms. South, at Long Beach, a large volume of drift discharged into the ocean by the Los Angeles River is just now floating back to shore; much of it is being carted away as firewood, and the city has temporarily permitted picnickers to build fires on the beach to hurry the cleanup.

North, in the mountains, activity in the debris basins and flood control dam area is intense. By March 24 207,000 yd. of the 700,000 yd. of debris that accumulated in the basins had been removed by shovels and trucks.

In the storage reservoirs, of which there is a total of 16, the flood left a large accumulation of debris for the first time in history. Investigation has revealed that the Sierra Madre reservoir is two-thirds full of silt; the original design contemplated that this structure would act as a debris dam. Santa Anita dam, however, is primarily for water storage, yet one-third of its 1,150 acre-ft. of reservoir capacity is occupied by debris. Most of the other smaller reservoirs are in a similar condition.

Road washouts make access to San Gabriel dam No. 2 impossible, so that its debris condition is unknown. At San Gabriel dam No. 1, the water level has been drawn down so that 5,000 acre-ft. of storage is available. Investigation is under way to determine how much of the remaining 7,500 acre-ft. is occupied by debris; the drawdown has revealed that the North Fork arm of the reservoir is badly clogged.

Experience of the flood has demonstrated that a circular or squirrel cage trash rack is the only satisfactory type where debris accumulation is severe. By keeping the top of the rack always above the level of the debris a clear outlet channel down the "Glory Hole" is maintained for sluicing. With the closed type of trash racks the debris clogs the outlets and makes both drawdown and sluicing impossible. Future designs will make use of the squirrel cage rack exclusively, according to Los Angeles County flood control officials.

The channel work in Los Angeles River and its dry wash tributaries was not seriously damaged by the flood and the works functioned satisfactorily. Principal damage occurred at points where work was still under construction. However, some damage did occur in other stretches of the Los Angeles River, and as a result of the flood experience minor changes will be made in the channel construction. These are reported to include grouting of the hand-placed stone banks and the substitution of vertical concrete walls for the stone banks at the outside of curves in the stream where cutting from high velocity currents tends to occur.

The railroad bridges which were lost have been replaced with temporary timber-pile trestles but no definite plans have been made to replace the highway bridges which, in most cases, were old timber structures.

Connecticut Compacts Approved By Senate

The Senate on March 25 approved, and then immediately voted to reconsider, the long-pending Connecticut River flood control compact. The vote was taken without debate in the course of passing a group of routine bills. Shortly thereafter opponents of the measure protested and moved to reconsider the vote on the ground that so important a measure should not be passed without full discussion.

The motion to reconsider is still pending.

• • •

New Planning Bill Is Introduced

(*Continued from page* 451)

the Budget Bureau before submitting the annual report, with his recommendations, to Congress.

The reports will also recommend the amount of local contribution that should be required of local governmental agencies for each specific project. Projects recommended by the board are limited to those already approved by the appropriate federal agencies. The jurisdiction of the board is also limited to projects in which the federal government has some financial interest.

The bill carries a general provision approving of interstate compacts in the field of natural resources but requiring specific approval of any compact before it becomes effective. Operations of the Mississippi Valley Commission and of the Tennessee Valley Authority are exempted from the interference by the bill. Existing state laws, water rights and policies, and the rights of individuals under them, are specifically protected from interference.

Reorganization Bill Passed By Senate

Corps of Engineers and Mississippi River Commission exempted from provisions

The Senate on March 28 passed a reorganization bill giving the President wide powers to consolidate and coordinate the work of various bureaus and departments within the executive branch of the federal government. The bill now goes to the House of Representatives, which has already passed two bills embodying parts of the plan.

As approved by the Senate, the measure would:

1. Authorize the President to reorganize or abolish the whole or any part of any federal agency.

He may not abolish completely or transfer to any other agency any of the functions of the Corps of Engineers of the Army, the Mississippi River Commission, or of any independent agency, nor may he create any new agencies to exercise functions not now authorized by law.

2. Abolish the present three-man bipartisan Civil Service Commission and replace it with a single Civil Service Administrator with authority to expand and develop the Civil Service system. The President is also authorized to cover into the civil service any present offices or positions except those of a policy-determining character.

3. Abolish the present Comptroller-General's office and place the pre-auditing function in the Director of the Budget, who reports to the President. An additional post-audit will be made by a newly-created General Auditing Office reporting directly to Congress.

4. Create a new Department of Welfare, headed by a cabinet member, and a permanent National Resources Planning Board of five members reporting to the President.

5. Give the President six administrative assistants.

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Nichols Firm Acquires Refuse Incinerator

The Nichols Engineering & Research Corp. of New York City has acquired the rights to the Decarie basket type garbage incinerator formerly offered by the Underpinning & Foundation Co. The latter company will continue to market a sludge incinerator.

J. E. Morris, J. C. Woodman, John Buffington, and Samuel Burgess, engineers formerly connected with the Decarie Corp., are now connected with the Nichols Corp.

High Court Upholds Title To Mare Island

The title of the federal government to the site of the Mare Island Navy Yard was upheld by the Supreme Court in an opinion handed down March 28. The government's title had been attacked by James E. O'Donnell, and his claim had been upheld by the Circuit Court of Appeals. Mr. O'Donnell's claim derived from a grant made by the state of California; it was asserted that the state had acquired title to the land under the Swamp Lands Act of 1850, by which Congress ceded public swamp lands to the state.

The government, on the other hand, held title through a grant made to one, Castro, by the Mexican governor of California before the Mexican War. This grant was upheld by the Board of Land Commissioners which was established in 1850, to pass upon Mexican titles, under the terms of the treaty of Guadalupe Hidalgo.

Mr. O'Donnell based his claim on the assertion that the Swamp Lands Act took priority over the decision of the Board of Land Commissioners and also on a claim that the federal government had been guilty of bad faith to the state of California in that it purchased the land in question while proceedings were still under way before the Board of Land Commissioners.

The Court pointed out that certification of title by the board, being required by the treaty, took precedence over the grants in the Swamp Lands Act, which merely included such lands not to be privately owned.

On the question of fraud, the Court held that proceedings before the board were of an administrative rather than a judicial nature, and that hence the fact that the United States had not contested the Castro claim after it had purchased the land did not invalidate the conclusions of the board.

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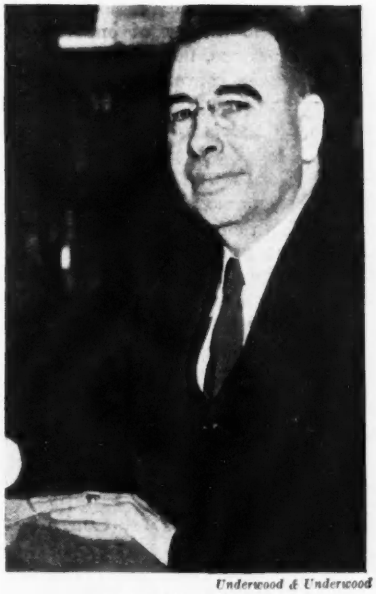
Senate Votes TVA Probe

Investigation of the TVA by a joint congressional committee was provided for in a resolution adopted by the Senate March 25. Early action by the House is expected.

Investigation would be made by a committee of ten drawn equally from both houses; it would have power to subpoena witnesses and records and be authorized to expend $50,000. The committee is directed to investigate the charges made against each other by the three TVA directors, to investigate activities of power companies in relation to TVA, and to investigate comparative power costs on TVA and other federal projects.



Underwood & Underwood

LEO OTIS COLBERT

Colbert Named Head Of Coast Survey

Leo Otis Colbert, chief of the division of charts of the U. S. Coast and Geodetic Survey, has been appointed by President Roosevelt to succeed the late R. S. Patton as director of the surveys. A native of Massachusetts, Mr. Colbert entered the Coast and Geodetic Survey in 1907 and has served there continuously except for war service as lieutenant commander in the naval transport service. He was appointed head of the charts division in 1933, and is a member of the Mississippi River Commission.

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Second Postponement Of Chasta Bids

Opening of bids for the $500,000 railroad diversion tunnel at Shasta Dam of the Central Valley project was deferred for the second time March 14 because of the failure of the federal Department of Labor to render a decision on prevailing wage scales to be required. The pending wage determinations are also holding up advertising of bids for eight miles of the Contra Costa canal.

Bids on the tunnel were originally scheduled to be opened Feb. 21 but they were postponed at that time at the request of contractors who said that they had had insufficient time to prepare bids and did not have the information as to prevailing wages.

Wage determination hearings were held in January and forwarded at that time to the Secretary of Labor.

LABOR NOTES

BUILDING OPERATIONS in Seattle, which have been suspended for two weeks in a dispute between the Seattle Construction Council and the Seattle Building Trades Council (*ENR* March 17, 1938, page 387), were resumed last week. It was agreed to submit to arbitration the question of whether the six- or eight-hour day should prevail. The six-hour day, which was called for in the previous contract, will be retained pending the negotiations.

IN DETROIT, existing agreements are to be continued without substantial change. Contracts have been agreed to effective March 1, covering a majority of the city's building contractors. The scale agreed to under the renewed contract ranges from $1.25 for carpenters to $1.60 for electricians.

A DELAY of three months on interior work on the Soldiers' Memorial at St. Louis has been ended by an agreement between C.I.O. and A.F.L. A.F.L. building trades workers struck last December in protest against the city's action in awarding a contract for the manufacture of showcases to a firm employing C.I.O. labor (*ENR* Dec. 16, 1737, p. 968). Terms of the agreement which ended the dispute were not revealed. Officials of the Usona Manufacturing Co. said they were making the showcases in accord with the original contract.

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Alabama Housing Project Held Tax-Free

Low rent housing projects in Alabama are exempt from state and local taxation, the Alabama state supreme court ruled in an advisory opinion requested by Governor Graves. The court pointed out that the state constitution restrains the legislature from taxing real estate or personal property of corporate bodies of the state, county or municipality.

A local housing authority, the court held, has the status of a municipal corporation. Its functions are public in nature since it is charged with the duty of enforcing an element of the police power in its supervision of proper housing conditions.

Of the 32 states having low rent housing enabling acts, 28, including Alabama, exempt low rent housing and slum clearance projects from state taxes either by statutory or constitutional provisions.

Coast Cities Plan For Skyways

Overhead highways off existing routes are proposed for Los Angeles and San Francisco

Special correspondence

California's two metropolitan areas, San Francisco and Los Angeles, have taken up with avidity the idea of a comprehensive system of overhead and express highways which would solve the traffic problem of getting motor vehicles into and out of city business districts. Although it is recognized as an extremely expensive operation, widespread support nevertheless has arisen for the move.

The proposal does not anticipate construction of overhead highways on or along any existing street but only on new routes in the middle or central portion of city blocks or in parkways, thus leaving present thoroughfares and stores without light obstruction. Figures accompanying announcement of the general plan show that the cost of constant stopping and starting in congested districts where motor traffic is heaviest is more than sufficient to offset the cost of constructing an overhead highway, and some plan of financing other than by taxation is favored.

In recent weeks meetings of civic leaders in the two California cities have developed a high degree of enthusiasm for the overhead express highway idea. The probable first step is the raising of funds to survey possible routes and work out a feasible plan for something like 60 or 70 miles of overhead highways in each of the two cities. Probable total cost, including property damage and rights-of-way, ultimately will run into several hundred million dollars.

The plan of financing proposed is either some form of gasoline tax or a bond issue. The type of construction would be such that the express route, for automobile or motor buses only, would provide three or four traffic lanes in each direction without any obstruction whatever and would include a central or downtown distribution loop with radiating branches of multiple-lane highways paralleling existing traffic arteries or boulevards.

The movement is an aftermath to the recent rejection by San Francisco voters of a subway proposal. A premise in the new program is that density and spread of population in the two California cities does not justify subway or elevated railway construction. Even if subways were completed and in operation today in the two California cities they would not solve the major traffic problem. In that state, with the record motor vehicle density of one car for every 2.3 persons, there is insistent demand for safe, convenient and economical means of getting motor cars from suburban districts to the city and back again. Meeting this problem with overhead highways will, in the opinion of advocates, enormously increase development of both city and suburbs and will do much to promote safety and to increase business volume.

The plan contemplates passage of the necessary laws at next year's legislative session. Preference is for surveys, preparation of plans and ultimate construction by some such non-political organization as the California Toll Bridge Authority.

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Few Aqueduct Bid Changes On Second Letting

Bids as opened Mar. 24 by the New York City Board of Water Supply for the first three tunnel sections of the Delaware River Aqueduct showed only a slight reduction from the figures submitted last November despite a reduction of 22 per cent in the minimum wages required by the contract. Last fall the bids for the first twenty miles of tunnel aggregated $34,000,000 (*ENR* Nov. 11, 1937, p. 771). At that time a protest arose over the high rates certified as "prevailing" by state and city authorities and stipulated as minima in the contract. After considerable controversy the November bids were rejected and the work readvertised with minimum rates set much lower than formerly. (*ENR* Dec. 16, 1937, p. 969; Feb. 17, 1938, p. 250). The new bids totaled $32,509,934, a reduction of only 4 per cent.

Contractors report that just prior to the second opening they received notice from Westchester County unions that labor would demand the high rates as first established. In February when the revised rates were announced by the city they were held to be acceptable to the unions. Gossip in contracting circles is that the bidders heeded the demands of labor and figured the work accordingly.

Low bids on the second opening are as follows: Contract 322: Utah Const. Co., Ogden, Utah, $10,829,530; previous low, Geo. H. Flinn Corp., $11,996,145. Contract 323: Seaboard Const. Corp., New York (Dominion Const. Co., Montreal, F. J. Herlihy, Chicago and B. Perini & Son, Framingham, Mass.) $10,810,166; previous low Siems-Helmers, Inc., and associates, $10,961,765. Contract 324: Arthur A. Johnson Co. and Necaro Co., Inc., New York, $10,870,238; previous low, S. A. Healy, Chicago, $10,985,695.

Labor and Material Bonds Required in New York

A bill authorizing the state comptroller to require surety bonds guaranteeing labor and material charges on all state contracts has been passed by the New York state legislature and is awaiting signature by the Governor. The bill is one of a large number drawn as a result of a study carried on during 1937 by the joint legislative committee for state fiscal policy.

The study made by the joint committee indicated that over the past ten years losses of more than $3,000,000 have been sustained by material dealers on state building contracts as a result of default by contractors. Losses amounted to nearly a million dollars on highway contracts alone.

The danger of increased cost to contractors and to the state as a result of requiring labor and material bonds has been disposed of by an assurance that there will be no increase in the premium rate on contract bonds; contractors engaged on engineering construction work in New York are already paying 1 per cent premium rate for performance bonds alone, while the 1 per cent rate is standard throughout the country on bonds covering labor and materials included with the performance bonds.

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Queens Tunnel Bids Are Opened

Bids for the Queens approach section of the Queens Midtown Tunnel were opened Mar. 29 by the New York Tunnel Authority. The opening was first scheduled for Feb. 25, but was deferred by the authority because the wage rates certified by the New York state department of labor as "prevailing," and therefore to be stipulated as minimums to be paid, were considered too high by the tunnel authority.

A resurvey of the prevailing rates by the labor department resulted in a new schedule somewhat lower than that originally proposed. The work, known as Contract 7, consists of a cut-and-cover approach section 1,100 ft. long, extending eastward from the construction shaft now marking the Queens end of the river tunnel. As in the case of the Delaware River Aqueduct tunnel bids, opened last week in New York, contractors report receiving an ultimatum from labor unions demanding a higher rate than minimum.

The low bidders were: Charles S. Vachris, Inc., Brooklyn, $2,228,964.50; Woodcrest Const. Co., Inc., New York City, $2,256,127.65; Thomas Crimmins Const. Co., New York, $2,584,942.

Interstate Compact Signed Allocating Rio Grande

Differences extending over 40 years between the states of Colorado, New Mexico, and Texas as to the allocation of the waters of the Rio Grande, and a pending suit between the states of New Mexico and Texas, approached solution March 18 when representatives of the three states signed a permanent interstate compact. The compact, replacing a temporary compact which expired in October of last year, will have to be ratified by the legislatures of the three states and approved by Congress before it becomes effective.

The compact, according to M. C. Hinderlider, state engineer of Colorado and representative of that state on the negotiating commission, apportions the total runoff above Fort Quitman, Texas, and protects existing water use in the three states by establishing guaranteed schedules of delivery to New Mexico and Texas based on the inflow into the Rio Grande from the states of Colorado and New Mexico.

Annual use of 790,000 acre-ft. of water from Elephant Butte reservoir is guaranteed in the compact, and unlimited reservoir development in the San Luis valley of Colorado is permitted. Rights of the federal government and treaty obligations to Mexico are also protected by the terms of the compact.

The compact was negotiated by a committee composed of Mr. Hinderlider, Thomas M. McClure, state engineer of New Mexico; Frank B. Clayton, El Paso attorney representing Texas; and S. O. Harper, chairman, representing the federal government.

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Ohio Highway Department Under Investigation

Ohio state auditor Ferguson has assigned three engineering examiners to check all contracts awarded by the state highway department. He acted as a result of indications of collusion with bidders and padding of estimates on asphalt highway contracts which were brought out in recent months by a special investigating committee of the Ohio Senate.

At the same time a sweeping temporary injunction which would have prevented the highway department from so much as mailing a letter was modified at the request of highway director Jaster to prevent only the removal from highway department offices of papers pertaining to the asphalt contracts. The temporary injunction was granted March 25 to Mrs. Agnes Dickinson who has brought a taxpayers suit seeking to recover the amount of which the state was allegedly defrauded.

Still pending is the suit brought by Harry A. Sparks seeking reinstatement to the position of bituminous engineer from which he was discharged, he claims, because of testimony he gave before the Senate investigating committee.

Globe Photo

A LONDON BRIDGE IS COMING DOWN

DEMOLITION of the old Waterloo Bridge at London has necessitated rerouting of street cars which formerly passed through the old Kingsway tunnel, left, to avoid street congestion.

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Robins Leaves Bonneville

Col. T. M. Robins of the U. S. Engineers, who has had charge of construction of the Bonneville Dam project, has been transferred from his position as district engineer at Portland, Ore. to assume command of the war department's engineering school at Fort Belvoir, Va.

Lt. Col. John C. H. Lee, who has been district engineer in Philadelphia, has been named district engineer at Portland, succeeding Colonel Robins.

Colonel Robins will leave for his new post in May. Colonel Lee is expected to arrive in Portland early in April and act as Colonel Robins' assistant until Col. Robins leaves for Fort Belvoir.

WASHINGTON HIGHLIGHTS

Special reports by Paul Wooton

FLOOD CONTROL legislation is under active consideration. Hearings began March 28 on the bill of Senator Overton, of Louisiana, proposing the immediate construction of the Morganza floodway, on the west bank of the Mississippi river just below Old River. Under existing law construction of the Morganza floodway is tied in with that of the Eudora floodway. Options covering seventy-five per cent of the flowage rights in the combined area must be secured before construction may be begun on either floodway. More than seventy-five per cent of the required options have been secured for the Morganza floodway. It has been apparent for many months, however, that the necessary options could not be secured for the Eudora floodway.

Combining of the two floodways was forced by Mississippi interests at the time the bill was passed. While construction of the Morganza project admittedly will do Mississippi no harm, it is feared that the Eudora diversion never will be provided once Morganza is built.

STREAM POLLUTION legislation appears deadlocked in Congress for this session. The rival bills, fathered by Senator Lonergan of Connecticut and Rep. Vinson of Kentucky, are both caught in a tight legislative jam in conference, after having passed their first battles in Senate and House. Efforts are being made to compromise the widely divergent features of the two measures, and particular attention is being paid to mitigating the stringent government control features of the Lonergan measure to make it agree more closely with the proposals of the Vinson bill. This latter would provide federal aid for states by means of government-supervised investigation as well as by services of engineering experts.

PROSPECTS for a larger amount of construction under the housing act than had been anticipated is one of the few bright spots in a gloomy business picture. Investigations in many communities indicate that uncertainty with regard to other investments has made many persons anxious to invest their savings in homes. A sharp increase in inquiries for building materials is reported.

News continued on page 483

COMMENT AND DISCUSSION

Readers' opinions on matters that concern the engineer

Planning for Soil Mechanics Conference

Sir: The letter signed by seven prominent Canadian engineers and published in *Engineering News-Record* of Feb. 24, 1938, is certainly timely and encouraging. If the spirit shown by these seven engineers is at all indicative of the general attitude of international engineering groups interested in soil mechanics and foundation engineering, the success of the next international soil mechanics conference would seem to be pretty well assured.

Volume 3 of the proceedings of the Harvard conference records Resolution 3, which provides for a permanent organization with K. Terzaghi as president and Arthur Casagrande as secretary and vice-president, provision being made for these officers to form an international committee to be elected by the various national committees. Provision is also made for the establishment of an executive committee. The conference voted its recommendation that the next international conference on soil mechanics and foundation engineering be held in Holland during 1940. Dr. Terzaghi and Dr. Casagrande have been continuously active in the setting up of various national committees and through them the international committee.

To many engineers it must appear that nothing has been done regarding the continuation of the work of the conference since the Harvard meeting, but in reality both Dr. Terzaghi and Dr. Casagrande have carried on a large amount of correspondence with prominent engineers throughout the world and have succeeded in initiating national groups or committees in France, Italy, Switzerland, England and Germany, and similar efforts are being extended to other countries. I understand that just as soon as national committees are properly organized, Dr. Terzaghi and Dr. Casagrande will proceed to combine such organizations into an international society in accordance with the resolution to that effect passed at the Harvard conference. I also understand that these gentlemen are now preparing a report to be sent to all members of the Harvard soil mechanics conference, which report will contain a description of the organization of all national committees and the work done by such committees, including a report of the activities of the soil mechanics and foundation technical division of the American Society of Civil Engineers, which constitutes the American group.

Obviously, the letter published by you from the seven Canadian Colleagues will be extremely helpful in promoting interest and cooperation for the next conference.

CARLTON S. PROCTOR
Chairman
Soil Mechanics and Foundation Division, American Society of Civil Engineers

Steel Walls

Sir: On page 930 of your issue of Dec. 9, 1937 I found a description of a building of which the outerwalls are constructed by means of thin steel sheets, with the remark that this building represents their first use on a large scale. Also on page 1041 of the issue of December 30, 1937, it is pointed out that in the year 1931 the walls of the Strong-Carlisle & Hammond Co. building have been executed already with steel walls. Perhaps it may interest your readers to know that in Holland many buildings are constructed with steel walls. The first such building was for the Oranje-Nassau Mining Co. at Heerlen (Limburg) of which I send you herewith a photograph. The building is planned by the well-known Dutch architect Dirk Roosenburg and executed by Messrs. de Vries Robbé at Gorinchem (Holland) in the year 1927. It contains a complete steel-frame. The walls consist of sheets 10 ga. steel with an internal insulation of blocks of light concrete and cork. After this first building other similar buildings have been built in various towns. This construction has not developed any weakness and in future it will undoubtedly be used very often.

E. A. VAN GENDEREN STORT
Consulting Engineer
The Hague, Holland

Bridge Dimension Incorrect

The thickness of the sidewalk slab on the Bronx-Whitestone Bridge given in the drawing at the bottom of page 398 of the issue of March 17 is incorrect. The slab is 3½ in. thick.

South Carolina's Roadbuilding

Sir: In the article on "Trends in Types" on page 52 of your Jan. 13 issue, South Carolina is credited with having constructed 406 mi. of bituminous macadam, and farther on in the article South Carolina is shown as having dropped out of the column of states constructing low-cost bituminous roads in 1937. Evidently the

Office building with steel walls in Holland.

construction of low-cost bituminous surfaced roads in South Carolina for 1937 has been tabulated in the wrong column. We did not construct any bituminous macadam, and we did construct a considerable mileage of low-cost bituminous surfaced roads.

J. S. WILLIAMSON
State Highway Engineer
Columbia, S. C., March 12, 1938

Free Engineering

Sir: An advertisement in a recent sanitary journal of a firm having a process for the treatment of sewage had the following note—"We serve as engineers or consultants". This firm should be commended on its honesty and frankness in stating plainly that it acts as engineer or consultant. There should be a clear understanding as to whether a concern acts as a manufacturer of equipment, as engineer, or in both capacities.

In the past and at present to a possibly somewhat lesser extent there have been concerns which were willing to furnish engineering as well as research work at no extra cost other than that included for the equipment. The situation would be clarified if such concerns were to state that they would be pleased to furnish detailed construction plans for municipalities or for those engineers who were not equipped or were too busy at the moment to prepare such plans. It would seem to be to the advantage of the manufacturer to have it clearly understood that its price for equipment included engineering and possibly other considerations.

Contrary to the popular belief, there is considerable cost involved in the proper preparation of a set of plans. The firm which includes this service in the price for its equipment must necessarily charge more for such a privilege. This is of no concern to the manufacturer if the plans are so drawn as to prevent competition with firms who simply furnish apparatus. If there is open competition, however, the firm which furnishes free engineering is at a disadvantage. It has been said that in some cases a company furnishing the equipment has been put to considerable expense to persuade the municipal authorities that its product is worth the additional amount which it is required to ask because of its "free" engineering services.

In other lines this difficulty has been solved by the concerns making a charge for any desired service. Such an arrangement might well be applied to equipment used for sewage treatment. The municipality which thought it desirable or cheaper to obtain its engineering with its equipment could do so and would realize at the same time that the engineering was an appreciable cost of the work. The municipality that would prefer to have an impartial engineer prepare its plans, paying an adequate fee for the same, would have the advantage of obtaining open competition from equipment concerns. Of course in municipal work competition is required by law and a municipality should not be led to believe that it is obtaining real competition when in effect it is not.

The views of other engineers on this subject would be enlightening.

WESTON GAVETT
Consulting Engineer,
New York, N. Y., Feb. 25, 1938

Mr. Wheatley's Teaching

Sir: I notice on page 286 of the February 24th number of *Engineering News-Record* in the middle column in the last part of an item entitled "Unlicensed Engineer Illegally Elected," the statement that "Mr. Wheatley formerly taught engineering subjects at Ohio State University."

Mr. Wheatley has never been a teacher of engineering subjects in the Ohio State University. He has never been a member of the University's collegiate teaching staff. For some years R. W. Wheatley was a teacher of "Miners' Vocational Night Schools" in eastern Ohio. These schools are under the joint direction of E. L. Heusch of the State Board for Vocational Education, and the Chairman of the Department of Mine Engineering of the Ohio State University. The material taught in these schools is not of collegiate grade. Requirements for admission to these schools are employment in or about a mine and the ability to read and write English and to add, subtract, multiply and divide with a fair degree of facility. Mr. Wheatley has not taught these classes for several years.

H. E. NOLD
Chairman, Mine Engineering Department
Ohio State University
March 4, 1938

Ample Amplitude

Sir: The news item describing the action of the Golden Gate Bridge during the recent high velocity wind brought out one very interesting point: the vertical wave action which traversed the bridge floor system along its length. On several occasions the writer has seen this phenomenon in spans of high voltage transmission lines. From observing this action it is the writer's opinion that these vertical movements of the floor system are caused by the main cables vibrating in their natural period. This vertical displacement is transferred to the suspender cables and ultimately to the floor system.

The writer recently observed a span of transmission conductors vibrating with such amplitude that they appeared about to rupture at their supports or pull the insulators from the poles. The conductors in question were No. 0 aluminum stranded cable with center steel strand. There was an ice loading of about $\frac{1}{2}$ in. on the windward side of a quartering 10 mi-an-hr. wind. The wave length of the harmonic vibration was equal to the span length (300 ft.), the amplitude approximately 3 ft. while the frequency was 1.1 cycles per sec.

During the violent vertical displacement the ice load remained intact on the cable while on other wires it would fall at the slightest touch of the hand. This would lead to the assumption that there was no stress in the ice and that ice and conductor were acting together.

While this phenomenon is well known, though seldom seen, the writer knows of no method whereby it can be determined what wind velocity will cause resonance. For transmission conductors ideal conditions seem to occur when the cable has an ice load, the temperature around the freezing point, and a wind of from 5 to 15 miles per hour. It is also obvious that vibrations of extremely higher frequency and of minute amplitude occur in conductors, for they have been found to fail by the repeated bending stress which occurs at the insulator saddles.

The writer would welcome any discussion which would serve to illuminate this interesting phenomenon of wind velocities and resonance.

STUART D. LONG
Civil Engineer, Consumers Power Company
Grand Rapids, Mich., March 8, 1938

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MARCH 31, 1938

FEW OBSERVERS of recent roadbuilding equipment as it was exhibited at the January road show in Cleveland failed to be astonished at the sizes to which old familiar tools have grown in a period of two years. It was difficult to realize that roadbuilding as the present knows it could have a place for the gigantic motor graders, tractor-scraper units, traveling asphalt plants and concrete paving mixers that equipment builders offered for service. These big machines are not mere exhibition pieces; they are being used on the road. A month of travel over roads under construction in a dozen of southern states recently disclosed frequent grading operations on which two or three of these large grader and power units were in use and were preforming alone virtually all grading from mass excavation and fill to the final smoothing of ditch and back slopes. The big equipment shown at Cleveland represents working tools that are being bought and can be seen at work wherever the season is advanced enough for roadbuilding. Now road planning must be pitched to the new conditions introduced by power equipment of a capacity and versatility heretofore unknown.

A Specific Example

THE TWIN MIXERS used on the Indiana roadwork described in this issue point to the new developments in equipment practice and contracting policy that must follow if the large capacity surfacing- and grading-machine units now being built are to prove their economic usefulness. In the Indiana operation the larger mixer capacity was utilized economically because all operations were mechanized to equivalent capacity and the contractor had a full season's work in hand—ten miles of dual four-lane road. Both requirements are involved if big equipment is to give its full value in speed and capacity to roadbuilding. The Indiana operation does not stand alone in proof of the fact. A study made of some 30 soil-cement processing operations carried on in 1936 and 1937 indicates that in such operations 40 to 60 mi. of work a season are required for the economic use of the big traveling processing machines. Such machines are now gaining a hold in bituminous surfacing, as exemplified in the work of revamping Ohio main roads described two weeks ago. Big equipment calls for bigger improvement planning in future roadbuilding.

Flood Experience

REASSURING NEWS comes from the Los Angeles flood area in the report that the flood-control structures of the present incomplete system performed well. The debris basins at the foot of the mountains, defenses against the mud-and-stone avalanches, often rolled down by floodwaters from the steep slopes, proved adequate in capacity, though practically filled by the solid matter washed down; to prepare them for renewed service more than 200,000 cu. yd. of debris have already been dredged out of them. The storage and detention dams also did the work for which they were built. Little damage was suffered by the channel works, though handlaid riprap proved vulnerable and where necessary will be grouted or replaced by walls. A significant observation is that, for the first time, many of the storage reservoirs received a large burden of debris. Santa Anita reservoir is said to be one-third full, and Sierra Madre two-thirds. Unless they are cleaned out they may become useless. It is reported also that some trash racks were clogged by debris, while in the newer dams the outlets were kept open by squirrel-cage racks high enough to extend above the debris. Study based on the experiences of the recent flood will bring greater safety to the entire region below.

Radio's Part

LESS REASSURING NEWS is the report of another flood experience—radio's failure to realize its full opportunity and responsibility in carrying information to communities deprived of other means of communication. Radio information broadcasts did great good in the emergency, but also serious harm. Some stations sent out alarming and wholly false reports of threatening failure of flood-control dams, though it would have taken only a few minutes to verify their safety by a call to flood-control district headquarters. As memories of the St. Francis disaster were fresh in every mind, fear and distress resulted from the false reports; in consequence frantic inquiries poured into the District's office, further burdening officials already under heavy pressure of rush work. It is to be hoped that the next emergency will not see a repetition of such irresponsible sensationalism, even if official discipline should be necessary to assure this. But in addition it would seem advisable to appoint leading radio stations as media of announcements by the authorities in times of public emergency, in order to make positive preparation for an essential community service. The full resources

of radio as an agency of communication should be made of service to the community.

A Good First Act

ONE OF THE MOST INFLUENTIAL of the agencies created by the new charter under which New York City now operates is the Planning Commission. As one of its first official acts it ordered hearings on a plan to rezone the Lower East Side of Manhattan, a section which has the dubious distinction of being one of the best known blighted areas in the country. By greatly increasing the area restricted to residences, decreasing that assigned to business and reducing the unrestricted zones to negligible proportions, the plan sets a good model. Rezoning stagnant areas that have been avoided or passed over by business creates no physical improvement in itself but does provide the foundation upon which improvement depends. If investment is to be encouraged, stability of land values must first be assured. If land speculation, based on hoped-for but patently impossible development of manufacturing or business, is to be eliminated, large areas must be made residential. In coming to grips with the problem in New York so promptly the City Planning Commission does the city a service and sets other cities a good example.

Wage Rate Dictation

PROTECTED by legal requirements calling for prevailing wages — invariably interpreted as the highest going rates — construction labor in New York state has always fared well on public works. Then, too, the strongly-organized unions in the metropolitan area have had little trouble in bargaining for higher rates whenever they saw fit to do so. Yet these advantages of law and custom apparently are not enough to satisfy Westchester County labor leaders, for they have resorted to new tactics to force unreasonably high wages on the Delaware River Aqueduct.

Last November, when bids were called on the first three 7-mi. sections of the tunnel, these labor leaders persuaded the state department of labor to certify as "prevailing" a scale of wages far above any actually being paid—in fact higher than had ever been paid, even in the boom days of construction. Amid much protest bids were opened on schedule, and the cost figures they revealed were beyond all estimate. Financing of the 85-mi. tunnel project was threatened by the increased costs.

Contract awards were held up pending a resurvey of wages. In February a new scale of prevailing wages was announced, averaging 22 per cent under those certified by the state department and more in line with actual rates. City and state officials stated that the revised schedule met with the approval of labor.

Last week new bids were opened. To everyone's surprise they turned out to be almost as high as the first bids, or in figures only 4 per cent lower. The explanation came to light subsequently shortly before the bids were to be opened. Labor leaders, who supposedly had agreed to the new rates, sent an ultimatum by registered mail to each bidder, demanding that the previous high rates be considered and stating that the revised rates were intolerable. Naturally, the contractors were in a tight spot. Fearful of labor-minded municipal and state authorities in case of a showdown, they felt forced to figure on the labor demands.

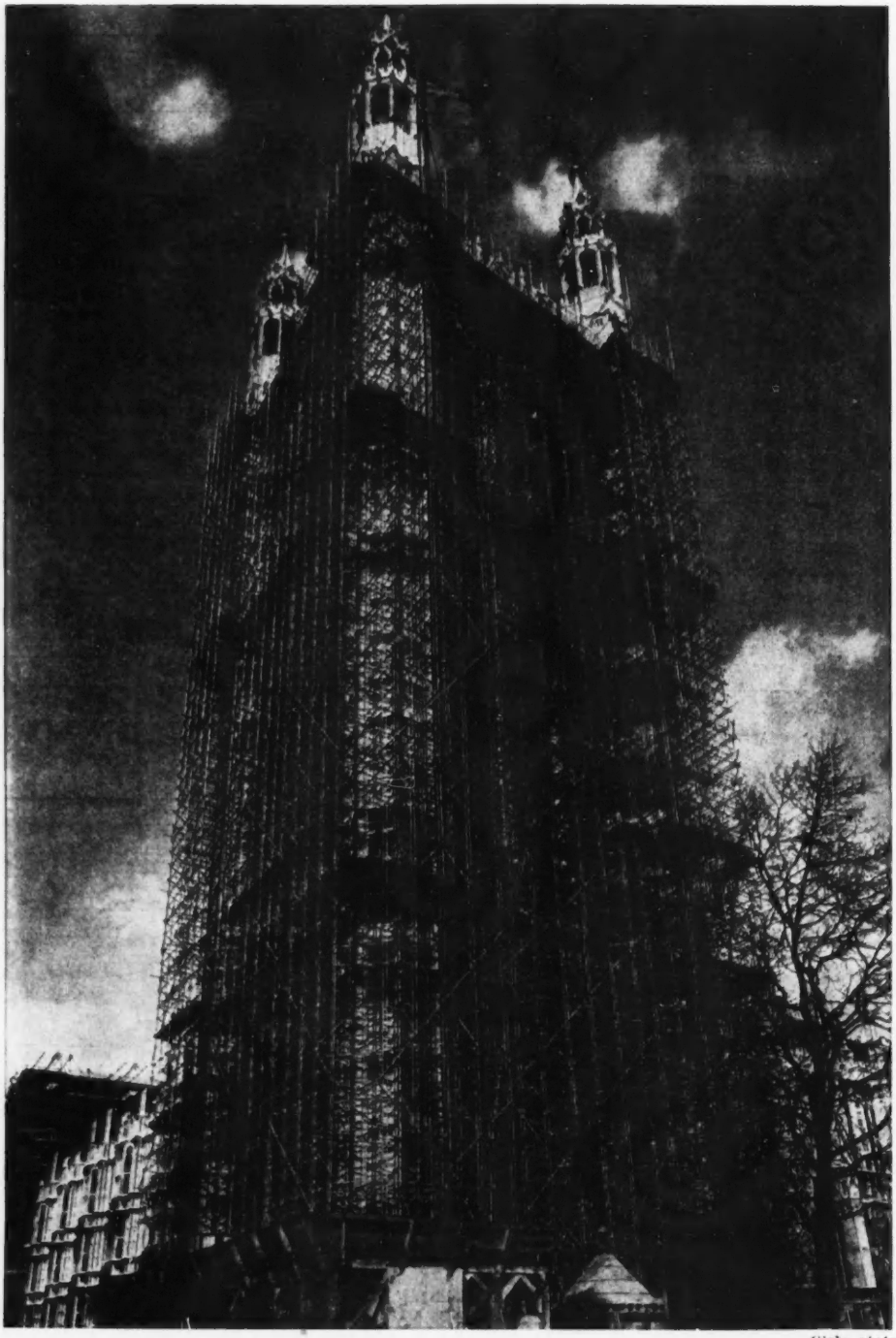
Labor's tactics in this case are clearly destructive. No reason or justification for them has been advanced. The usual argument for high hourly rates in construction—short-term and intermittent employment—does not hold here, for the jobs in question provide four or five years' steady work. The cause of labor prosperity is not furthered by the attempt to extort high rates, for there is an economic ceiling to wage rates, beyond which the construction market is throttled—to the detriment of labor as a whole. Further, the A. F. L. unions concerned in the present case have made the C.I.O. type of tunnel workers' organization, as exemplified by the Baltimore water tunnel set-up, all the more attractive to the contractors, especially as the C.I.O. group has announced the revised wage scale as satisfactory.

The bids should be rejected as against public interest, for the already hard-pressed taxpayer is subjected to the added burden of paying for undue benefits to a special class.

In addition the state department of labor's method of determining "prevailing" wage-rates ought to be made the subject of official inquiry. The present case is not the only instance of the labor department certifying non-existent rates as "prevailing," for only last month the New York Tunnel Authority deferred calling for bids on the approach to the Queens tunnel when it learned that the rates proposed to be certified by the department were outrageously high. Bids were opened this week under a revised wage schedule determined by a resurvey at the insistence of the Tunnel Authority.

Excessive labor costs are especially objectionable at a time like the present, when public officials are compelled to reach out in every direction for new taxes to meet ever-mounting costs and the grave added burden of relief. Unwarranted inflation of construction labor rates on public works must be checked, and when such inflation is condoned and even aided by labor department officials, public protest is in order.

PICTURES IN THE NEWS



Globe photo

A MAN-MADE JUNGLE surrounds the Victoria Tower of the Houses of Parliament in London. This scaffolding is for extensive renovation work now being carried on.

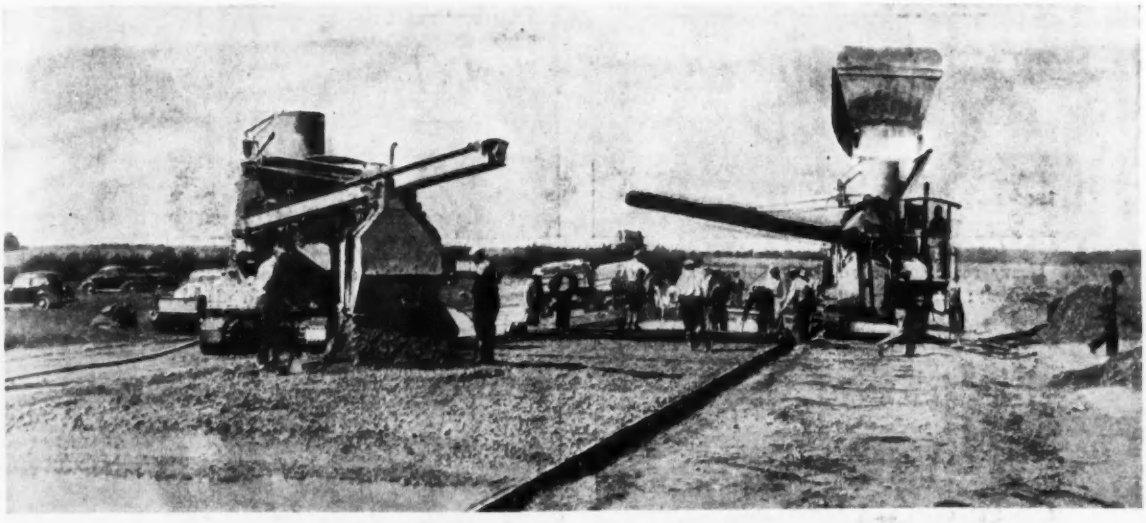


FIG. 1. TWIN PAVERS, WORKING BOOM TO BOOM, ON 11-FT. SHOULDERS SPEED PAVING

Twin Mixers Speed Paving

Two pavers working boom to boom on 11-ft. shoulders on opposite sides of the two-lane slab pave 1500 to 1800 ft. daily

EXPERIENCE in working two mixers side by side in concrete paving has been various. Last fall, on two-lane slab construction in northern Indiana twin-pavers made daily records of 1,500 to 1,800 ft. on 6-mi. of road. The conditions were favorable. It was possible to close the road to traffic, the right of way was wide, the old road had a good line and grades and it was possible in preliminary grading to widen out the roadway to provide working and plant room and particularly room for turning trucks. The design called for 11-ft. shoulders and flat ditch and back slopes. And finally both the plant that served the mixers and that for grading were remarkably complete.

The special feature of the operation was of course the use of two paving mixers working on opposite sides of the slab on the 11-ft. shoulders. But the amount and wide variety of equipment were also notable and require to be kept in mind. The mixers were 28E machines. Both worked in the same direction, one a little in advance of the other as shown by Fig. 1, pulling away from the slab and receiving proportioned batches from trucks coming in over the grade. A point to be noted is that while the mixers worked close together they were entirely independent in operation; each was served by its own fleet of trucks which traveled down that side of the road on which the mixer was operating.

Both truck fleets were served by the same batching plant; this had been used on an adjacent job and the contractor did not move it for the new operation so that there was a fairly long haul. The batching plant was modern with a clamshell unloading crane; sand and stone bins, and bulk-cement storage, unloading and weighing equipment. Three batches were hauled in a truck.

The work in steps

As an example of modern, mechanized roadbuilding a step-by-step account of equipment and operations is instructive. Illustration by photographs of machines at work are combined with descriptive text and the two need to be studied together to get the entire picture. To coordinate description and illustration the work was studied by the editor in the field.

Preparing the Grade—As stated the work was improving an old road whose alinement and longitudinal profile were good. Grading therefore was not a heavy operation; widening out the roadway and flattening the ditches and backslopes were all the large movements of earth that were needed. A power shovel and trucks were used to a limited extent in the preliminary rough grading but most of the earth was moved by heavy road graders and tractor-hauled carryall scrapers, Fig. 2. For smoothing the rough grade a tractor-hauled rollover scraper, Fig. 2, was found to be an excellent tool.

Formsetting preceded the fine grading as shown by Figs. 2 and 3. In fact even before rough grading was finished the forms were distributed. In general the forms were pulled and moved ahead each morning and by a clever method the contractor could lift and drop 3600 ft. of forms in 1½ hr. As shown by

Fig. 2. Heavy road grader on final rough grading of roadway; forms ready to set.

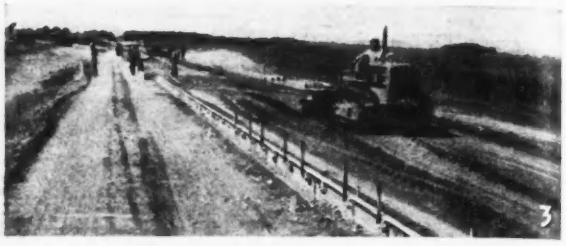


Fig. 3. Rollover scraper for dressing up roadway; forms have been set in place.

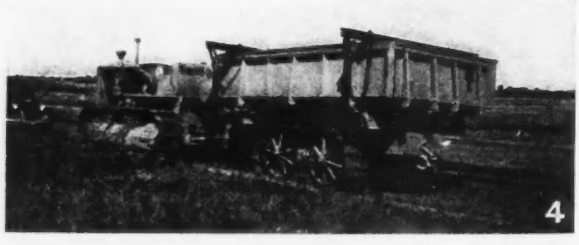


Fig. 4. Three-way dump wagon fitted with chains and hooks for pulling and moving forms.

Fig. 5. Form grader cutting out trench for forms; works to chalkline guide set to true line and grade.

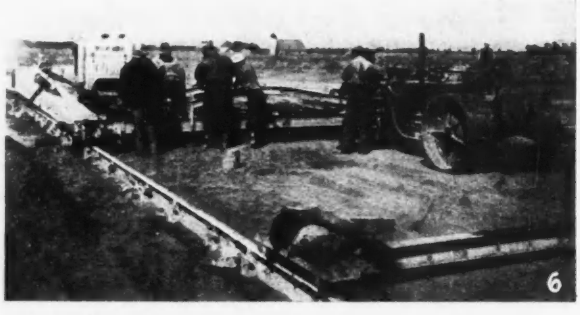


Fig. 6. Self-propelled subgrader, 3-ton roller, and the scratch template for final checking of subgrade.

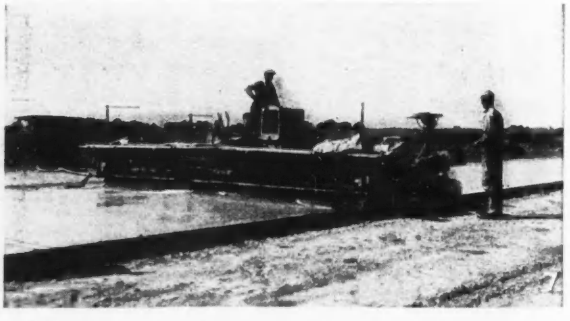


Fig. 7. The gas-electric combination screed, tamper and finisher with hand vibrator for the joints.

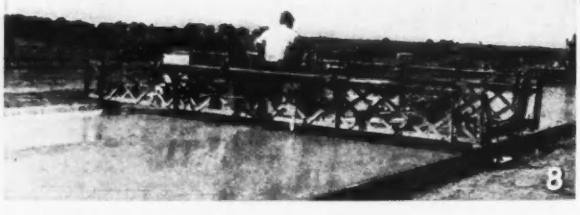


Fig. 8. Center joint placing machine, self-propelled, cuts slab and places joint filler.

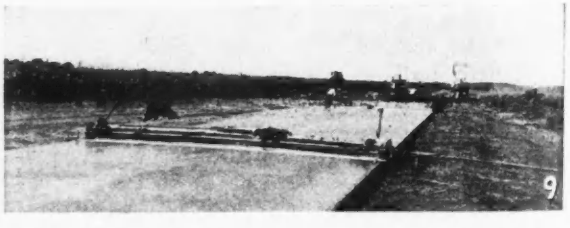


Fig. 9. Transverse belt finisher operated by hand through lever mechanism.

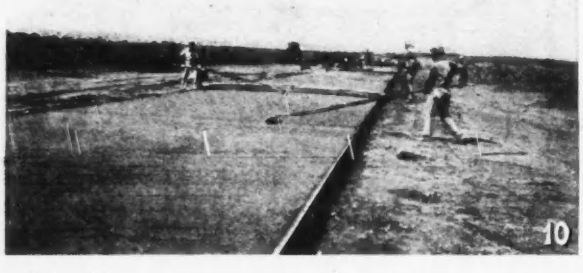


Fig. 10. Final brooming of the slab surface to prevent skidding.

Fig. 11. Placing the burlap for curing from a traveling float bridge.

Fig. 4 a three-way-dump trailer was rigged with chains and hooks on one side. Hauled by a tractor the trailer was pulled alongside two lengths of form which had been uncoupled at every other joint. By tilting the trailer body toward the form the hooks were attached to it; leveling the trailer body lifted the form clear of the ground and, so suspended, it was carried ahead to where it was wanted and a reverse tilting operation placed it on the ground.

Following the rough grading a form grader (Fig. 5) plowed out the trenches for the forms which were then set and pinned to profile. This operation set the scene for the fine grading. A subgrade traveling on the forms (Fig. 6) trimmed the subgrade to exact profile wasting the trimmings outside the forms. A light rolling with a 3-ton roller followed. The grade was then checked with a scratch templet riding on the forms (Fig. 6) and any high or low spots that were disclosed were corrected by hand. As all hauling was done on the shoulders, the finished subgrade could be kept in almost perfect condition for concreting.

Laying the Pavement—Normally the two mixers did separate parts of the slab concreting; one working a little ahead placed the part below the mesh reinforcement and the mixer following placed the part above. But as the volume of concrete below the mesh is somewhat greater than that above, the second mixer frequently overtook the first and then the first mixer was rolled ahead and the second concreted both base and top until the gap was closed and the normal division of work could be resumed. By this arrangement neither mixer reduced output.

Slab construction followed substantially normal procedure. Transverse joints were set on the subgrade; the first layer of concrete was spread and smoothed by a hand screed; the reinforcing mesh was laid, and the top concrete was poured and shaped by a gasoline-electric finishing machine (Fig. 7). This machine also carried and provided power for an electric hand vibrator with which the concrete at the joints was compacted. The center joint was placed by a traveling jointer (Fig. 8) which cut through the slab and inserted the joint filler.

Naturally two large mixers required a lot of water and here is where modern equipment again came into the picture. With a triplex pump of a new type enough water for all operations was delivered by a 3-in. pipe line from a pumping station at a creek crossing about midway of the work.

Finishing and Cleanup—Several finishing operations followed the placing of the center joint. In order they were: (1) Transverse screeding with a longitudinal two-man screed operated between two bridges; (2) floating with long-handle one-man floats operated from each side of the slab; (3) belting with a transverse belt hanging from a single bridge (Fig. 9) and worked back and forth by a hand lever arrangement; (4) removing the metal caps, raking and tooling the transverse joints; (5) brooming the surface (Fig. 10) with long-handle brooms and (6) curing for 7 days with burlap laid from bridges (Fig. 11) covered with straw and kept wet. After the burlap and straw had been cleared away one more piece of equipment did its work; a tractor-pulled shoulder grading machine finished the 11-ft. shoulders to profile the slope.

Works supervision

The road described runs south from Gary, Ind., and connects with the new four-lane dual road of route 30 to Chicago which was built this year. It is a 20-ft. 9-6-9-in. concrete with 11-ft. shoulders all built to the standards of the Indiana highway department, M. R. Keefe, chief engineer. The direct supervision was under Oliver Downs, district engineer, E. H. Sweeney, construction engineer and F. S. Hill, project engineer. The contractor was Thomas McQueen, Forest Park, Ill., with R. E. Harper as superintendent.

• • •

Grand River Project in Oklahoma

THE THREE PURPOSES of the Grand River Project in Oklahoma are the generation of power, the control of floods in the Grand River and Arkansas valleys and the creation of a recreational area around the 46,500-acre lake. The state has set up the Grand River Dam Authority as a conservation and reclamation district. It is administered by nine directors appointed from the various counties in the district, three by the governor, three by the state attorney-general and three by the state labor commissioner.

The first structure to be built is the Pensacola Dam at a site 65 miles northeast of Tulsa. The preliminary plans call for a dam, 6,000 ft. long, creating a lake of 46,500 acres, having a storage capacity of 1,680,000 acre-ft. with pool level at El. 745.

It is proposed to utilize a drawdown of 30 ft. equivalent to 1,000,000 acre-ft. of power storage. A flood of 220,000 sec.-ft., the largest recorded flood which ever occurred on Grand River (1895), could be controlled by this reservoir and the Grand River below the dam could be kept within its banks at a capacity of 80,000 sec.-ft., the lake level rising only 5 ft. above the pool.

Some 4,475 ft. of the reinforced-concrete dam will be of the multiple-arch type. The main spillway, gravity overflow section, 815 ft. long, will be located at the east end of the multiple-arch section. At the west end will be the powerhouse and a short gravity non-overflow section. The maximum height of the arches in the multiple arch section will be 142 ft., rising to El. 757, 27 ft. above the crest of the main spillway. The entire length is to be controlled by twenty 36x25-ft. radial gates, with top at El. 755. From the end of the spillway to the west end of the dam will be a non-overflow gravity section 800 ft. long. Across the top of the dam will be a 24-ft. roadway.

One mile east of the dam, an auxiliary spillway of gravity concrete overflow type, 920 ft. long, will be built in two sections, both bridged by the roadway. The spillway crest at El. 740 will be controlled by 36x15-ft. radial gates. The two spillways of the dam have a discharge capacity of 525,000 sec.-ft. Bids were asked in January for foundation drilling and spillway excavation.

The project, which also includes transmission lines, railroad and highway relocation and bridges, has a $20,000,000 PWA allocation, of which $8,437,000 is grant. R. V. L. Wright is general manager and Holway Neuffer, Tulsa, are engineers.

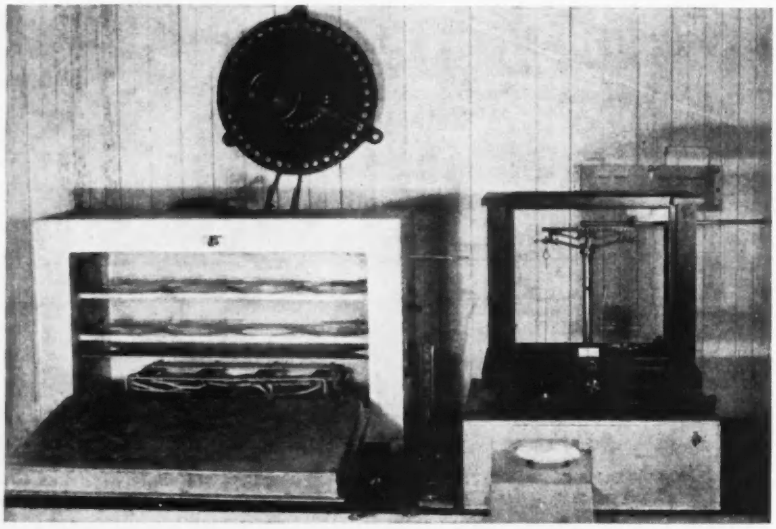


FIG. 1. ELECTRIC OVEN (LEFT) AND BALANCE. THE LATTER RESTS ON A HOT BOX

Simple Methods and Equipment Test Seepage from Dams

by S. S. GREEN
Junior Civil Engineer, Los Angeles Bureau of Water Works & Supply

Seepage from Los Angeles water supply dams examined for possible erosive conditions

TESTING seepage water from earth-fill dams is regular routine in the laboratory of the Los Angeles Bureau of Water Works & Supply where interest, primarily, is in the solid content carried in solution; particularly that part of the solid content that was picked up as the water passed through the dam. Seepage is not considered detrimental unless the percolating waters dissolve and bring away considerable quantities of solids. To facilitate tests of seepage waters, special equipment was built in the Los Angeles laboratory as described in the following.

Solids in solution in water samples taken from the reservoir are compared with those in seepage water and the difference is put down as gain while percolating through the structure. Ordinarily, the quantity of solids is recorded in terms of tons per miner's inch of water flowing for a period of one year. (1 miner's inch equals 0.0244 sec.-ft.)

For dams in the Los Angeles water supply system the range of solid content is from 5 to 40 tons per miner's inch per year and the corresponding percentage of dissolved solids ranges from 0.025 to 0.200 tons per miner's inch per year. Ordinarily, the greater part of dissolved solids is found to come from abutments rather than from the earth fill of the dams themselves. Chemical composition of the solids in the percolating water ordinarily is not considered important; when the quantity of dissolved salts is large, samples are saved for analysis.

To facilitate speedy handling and comparison of 100-gram water samples, which are standard quantities for these tests, an electric oven was built in the laboratory designed to evaporate 8 samples to dryness simultaneously. The oven is a sheet-metal box lined with 2 in. of asbestos fiber. Its inside dimensions are: width 26 in.; height 12 in.; depth 6 in. Over the heating elements are two shelves each consisting of sheet metal with circular holes of a size convenient for supporting the glass evaporating dishes. Four 200-watt heater strips are mounted on the bottom of the oven and from these leads are carried out to a rheostat of the theater-dimmer type which is set to maintain an oven temperature of 160 deg. F. The temperature is checked and setting of the rheostat is made by hand in accordance with readings from a thermometer inserted through a hole in the oven wall.

At the outset hot evaporating dishes and dry salts just from the oven were weighed on an ordinary analytical balance. With this method errors ranging from 5 to 60 per cent resulted from convection currents in the scale box, absorption of hygroscopic moisture by the plates and salts and the deliquescense of certain salts.

To overcome these difficulties another electric oven was built for use in conjunction with the balance. Essentially this is simply a metal box lined with 2 in. of asbestos fiber, containing a 500-watt heater element. The element is manually controlled and the box was built of a size to fit under the balance. This provided a chamber into which an evaporating dish can be transferred directly from the oven and thus be kept in a hot, dry atmosphere while it is weighed. A hole was drilled in the bottom of the scale case directly below the support on the balance arm and by extension of the suspending wire a new balance pan was hung in the hot box. The suspending wire was made in two parts and the sections were connected by means of threaded sleeves. Articulated connections were first used but were less successful than the rigid joints.

A sample to be weighed is removed from the electric oven and placed immediately in the balance pan within the hot box. Temperature in the box is brought up to 315 deg. F. (as indicated on a thermometer extending through the wall of the box) and then allowed to reduce to less than 300 deg. F. This cooling requires 7 or 8 min., during which period convection currents die out. The weighing then is done at exactly 300 deg. F. The weighing is repeated after the temperature has again been raised to 315 deg. and allowed to cool to 300 deg. once more. Usually the readings check to within 0.001 grams; a maximum error of 2 per cent in the range of dissolved solids that usually occur in the test samples.

Designing Lateral Supports For Compression Members

by GEORGE E. STREHAN
Consulting Engineer, New York N. Y.

Conventional practice, condoned by building codes, permits unsafe construction and may have contributed to apartment collapse in New York

In correspondence published in the Sept. 9, 1937 issue, p. 415, relative to the collapse of an apartment house on Mosholu Parkway, The Bronx, New York City (ENR, July 15, 1937, p. 93), George E. Strehan suggested that inadequately braced columns may have been a contributing cause. Elwyn E. Seelye, a member of an official investigating committee and author of the July 15 article noted above, does not believe that the columns failed but agrees that light steel columns are a potential source of danger and warrant study. In the following article Mr. Strehan suggests two methods of analysis that may yield safer structural details for compression members requiring lateral support. —EDITOR.

THE QUESTION of lateral support of compression members, including the compression flanges of girders as well as vertical columns, merits searching attention. Unintentional lack of straightness of the member combined with intentional eccentricity of the load and complicated by inadequately designed connections result in dangerous construction. The use of small column sections aggravates the problem, primarily because of the difficulty of making satisfactory connections and providing for eccentric loading. In the case of single- or double-angle struts, it is customary either to assume a portion only of the outstanding leg area as effective, or to reduce the allowable theoretical load by an empirical percentage.

Fig. 1 shows the general features of the framing plan which was designed to support the collapsed tower structure in the Mosholu Parkway apartment building. The 6-in. 20-lb. columns with wide-flange girders framing into the column flanges, the latter unequally loaded, offer the same difficulties. Due to eccentric connections, the columns are probably less than 50 per cent effective, and the safe load should be limited to less than 30 kips, even if efficient lateral bracing were provided. The 3x9 in. lateral wood bracing on a 22-ft. span, presumably with the hook anchor detail illustrated, are of excessive length for dead load only. The theoretical deflection under the design load is $1\frac{3}{4}$ in., whereas the usually allowable deflection on the 22-ft. span is $\frac{3}{4}$ in. It would be possible to brace a structural steel column with wood beams, provided they are of sufficient depth and stiffness and provided a positive, through-bolted connection is made on both sides of the column. The above details are emphasized at the risk of repetition because of the writer's definite conviction that this structure contributed largely to the collapse and represents what is not uncommon practice. It should be noted too that this bent was designed to support heavy masonry loads, which in no event should be done with combustible construction.

The framing of beams to a steel column by simple shear connections is generally bad practice. The connection should provide sufficient restraint to develop the eccentric moment and make the full column section effective. The loading and deflection of the girder will induce bending in the column to resist the tendency to rotation of the joint.

In this case a column of larger section would be dictated than that illustrated in Fig. 1. The rotating moment could be resisted by the dead load moment of the oppositely framed girder provided it were properly connected. The new building code of New York City provides that, when the bending stress in a column due to eccentric loads exceeds 10 per cent of the direct uniform stress, the column section must be reinforced in some manner to equalize more nearly the stresses on the section. In most cases, a simple expedient will avoid all these complexities. In the case under consideration, the girder could be framed continuously across the top of the column and thus produce a uniform stress condition.

Magnitude of lateral forces

All specifications and building codes require lateral bracing for both compression members and compression flanges of girders if the full specified unit stresses are utilized. Column loads are based on unbraced length, and fiber stresses in compres-

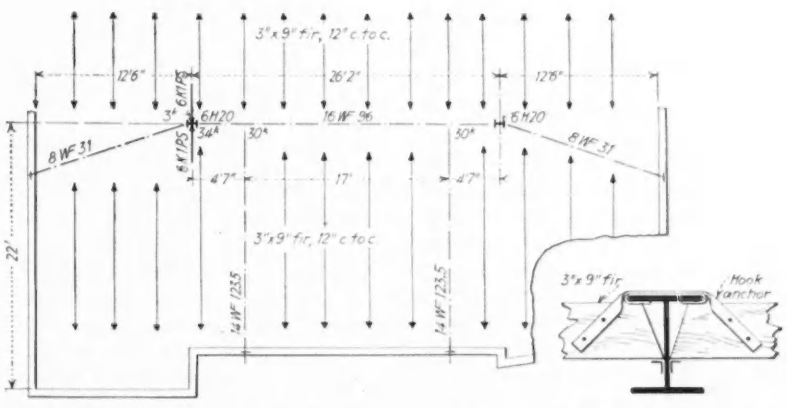


Fig. 1. Framing that supported the penthouse on the Mosholu Parkway Apartments in which the lateral support for the steel bent provided by the timber joists is held to have been inadequate.

sion flanges must be reduced when the unbraced length of the flange exceeds 15 times its width. But nowhere is the type, character, or strength of the required lateral bracing defined. If left to judgment only, results similar to the Mosholu Parkway apartment design may be expected. Previous failures have occurred in long, slender steel columns due to similar defects. The provision of adequate lateral braces would not necessarily have rectified the design of those particular columns; but the bents would have been structurally more stable.

The writer does not know of any theoretical determination or definition of what constitutes an adequate lateral brace. The magnitude of the lateral force necessary to hold the column and fix the panel point is apparently small. It would seem quite evident, however, that the connections of the bracing to the member must be such that slippage or free motion is prevented in the connection. Also, the slenderness ratio of the bracing member must not be excessive for a compression member of secondary character, usually limited to 200 for steel. Finally the bracing must be sufficiently stiff to limit its vertical deflection.

Basis of analysis

While it is realized that the actual thrust that a lateral brace must resist to maintain the integrity of a compression member is somewhat indeterminate whether the main member be a column or a compression flange, the writer has attempted by analysis to define "adequate bracing," and presents these requirements with the hope that discussion may lead to a careful study and solution of this problem. Two methods of analysis were used.

Method (a) is based on a calculation of the passive lateral moment or potential force that will develop the design stresses on the compression flange of a beam or girder, or on the section of the column or strut. Method (b) assumes that the energy stored in the member by virtue of the external work performed in deforming it under all its directly applied loads is released to produce a lateral bending stress, and the corresponding potential horizontal force that would perform the same amount of work is computed and applied to

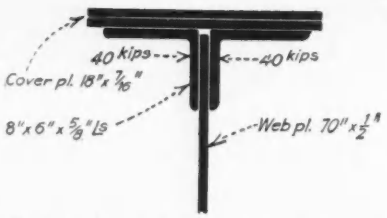


Fig. 2. Typical compression flange of a plate girder subjected to a lateral thrust which must be resisted by carefully designed bracing members.

prevent such lateral deformation through the agency of the bracing.

Let,

W=vertical load uniformity distributed on a beam in lb.

T=horizontal load to be resisted by lateral braces of the compression flange of a girder or lateral bracing of a column in lb.

L=unsupported length of the compression flange of a girder or the unbraced length of a column in ft.

n=number of lateral braces on one side of the compression flange in the entire length of the girder

A=area of cross-section of a strut or column in sq.in.

I=moment of inertia of a strut or column about the axis under consideration

I_1=moment of inertia of the entire section of a girder about the horizontal neutral axis

I_2=moment of inertia of the compression flange of a girder about the vertical axis through its center of gravity

S=section modulus of a strut or column about the axis under consideration

$S_2=I_2$ divided by the half flange width, or the lateral section modulus of the compression flange of a girder

f=reduced fibre stress allowed in compression flange when not braced laterally

f_1=direct uniform stress on the section of a column or strut in lb. per sq.in.

f_2=extreme fibre stress in the compression flange of a girder or the bending stress on a column section due to eccentricity of loads or rotation of columns in a rigid frame

Equations 1 and 2 are proposed to determine the bracing thrust for compression flanges of beams or girders and Equations 3 and 4 to determine the lateral bracing.

$$T=S_2\frac{[f_2-f]^*}{L} \qquad (1)$$

*AISC formula $f=\dfrac{20{,}000}{1+\dfrac{l_2}{2000b_2}}$

in which l=entire length of beam or girder

$$T=\frac{W}{4}\sqrt{\frac{I_2}{I_1}} \qquad (2)$$

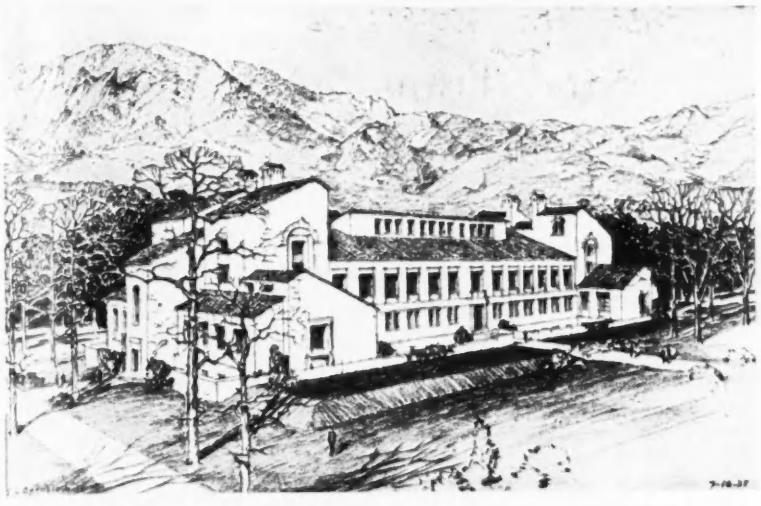
$$T=\frac{S[f_1+f_2]}{L} \qquad (3)$$

$$T=\frac{f_1}{L}\sqrt{A\,I} \qquad (4)$$

Application of methods

In the frame of Fig. 1, the l/r for the 6-in. 20-lb. H with 9 ft. 6 in. unbraced length is 75.5; $f_1=37/5.89=6300$ lb. per sq.in., and $f_2=90/13.1=6860$ lb. per sq.in.; S in the weak direction is 4.50; A is 5.89 sq.in.; and I=13.5. Under Eq. 3, the lateral brace must resist a thrust of 6.2 kips and under Eq. 4, a thrust of 5.2 kips. A 6-in. 15½-lb. H brace on the 22-ft. span will meet the requirements with a deflection of less than ¼ in. under the combined stress due to the direct thrust and vertical bending produced by its own weight.

In Fig. 2 is shown the flange section of a plate girder on a span of 60 ft. The lateral section modulus of the flange, S, is 73.5; the extreme, design fiber stress is 18,000 lb. per sq.in. under a vertical load, W, of 427 kips; I, is 76,500 and I_2 is 661. The reduced flange stress with no lateral bracing under the A.I.S.C. formula is 11,111 lb. per sq.in. To develop the full stress of 18,000 lb. per sq.in. requires lateral bracing distributed over the entire length of flange sufficient to resist a thrust of 40 kips under Eq. 2. If two braces are provided at 20 ft. intervals, Eq. 1 shows a thrust of 17 kips and Eq. 2 one of 20 kips on each brace for which it must be proportioned. Either the floor system on both sides of the compression flange must be rigid enough to receive a thrust of this amount; or be so attached as to furnish a rigid tension tie in both directions; or compression struts may be installed at the third points.



SKETCH OF ENGINEERING BUILDING UNDER CONSTRUCTION AT BOULDER, COLO.

New Engineering Building For University of Colorado

by C. L. ECKEL

Head, Department of Civil Engineering, University of Colorado, Boulder

Modern class and drafting room facilities to be provided in new building of striking design

CONSTRUCTION is under way on a new Engineering Building on the campus of the University of Colorado at Boulder. Construction of two wings for the Liberal Arts Building is also well along so that the new Engineering Building, to supplement existing facilities, is the second campus project in the ten-year building program which was authorized at the last session of the legislature. Construction of both buildings at this time is made possible by PWA grants of approximately 45 per cent of the cost of the buildings. Including furniture, the cost of the Engineering Building will be about $205,000. Not including office and class room equipment, the cubic foot cost is 29 cents.

The new building is I-shaped and faces north with the long axis east and west. It is 243 ft. long, 95 ft. wide at the end tower sections and 51 ft. wide between the towers. Omitting halls and stairways, the new building has a useable floor area of 38,500 sq. ft. and will provide 6,400 sq. ft. for an engineering library, twenty-five class rooms of 445 sq. ft., four class rooms of 565 sq. ft., five class rooms of 640 sq. ft., two class rooms of 1,275 sq. ft. and three class rooms of 1,800 sq. ft. The estimated capacity of these rooms is 1,100 students at one time. The dean's suite of offices will occupy 1,300 sq. ft. and twenty-eight offices will average 225 sq. ft. of floor space. A faculty conference room is provided on the first floor. Most of the third floor is planned to accommodate classes in freshman drawing. These rooms and other drafting rooms which are located on the second floor will be lighted from the north. One of the class rooms on the fourth floor will be used for blue-printing and another will be used for photostat equipment. A typical class room has a window height equal to about half the width of the room and a window area of 25 per cent of the floor area.

The architectural treatment of the building is in conformity with that of the more recent buildings on the campus. This is an adaptation of countryside architecture in northern Italy by Charles Z. Klauder to meet the needs of the university and is now commonly known as the "University of Colorado style of architecture." As evidenced by moats which almost surround the building and unbalanced gable treatment, the new Engineering Building will have an individuality of its own. As is the case in the other University buildings on the campus, the fenestration adds materially to the appearance of the building.

The building is to be faced with rough native stone, known locally as Lyons sandstone; individual stones are limited to a 36-in. maximum length and a 5-in. thickness. Care will be taken to mix the stone in size and color. The brimstone will be Indiana limestone.

Structural features

The exterior walls are 17 in. thick above the first floor and are bearing walls while the floors are of pan construction supported by reinforced concrete beams and columns. Hollow-tile partitions are used throughout. In addition to dead load, the building is designed for a live load of 50 lb. per sq. ft. in class rooms and offices and 100 lb. per sq. ft. in corridors and on the stairways. Since most spans are approximately 20 ft. long, pan construction is economical in the floors. The construction is 8 in. plus 3 in. with 20 in. pans and a minimum joist width of 5 in. except under partitions or in locations where future partitions may be built where joists are 9 in. wide. Tapered joists are used where necessary to provide shear resistance.

The roof framing in the tower sections will be of wood. Ceilings are to be furred and plastered. In the middle section of the building, light 12-in. steel H-sections with a 2-in. x 4-in. nailing strip on the top flange of the beam will be used. These beams are exposed. Roof insulation 1½ in. thick will be butted against the nailing strips and blind nailed to the 2-in. sheathing which will be covered with asphaltic felt. Nailing strips for the roof tile are 2 x 4's spaced about 12 in. centers. Tile in four colors will be used.

Exterior doors of hollow metal are specified. Interior door frames are

of metal but doors are of birch. Steel sash are to be used throughout the building. The floor covering is 12 x 12 in. x $\frac{1}{8}$ in. gray asphalt tile. A 6-inch cement base is used throughout the building. Stairs are of reinforced concrete with metal safety nosings and $\frac{3}{16}$-in. asphalt tile on treads and landings. Blackboards are of green Optex, 48 in. high and trimmed with birch. To meet electrical requirements, No. 10 wire is used on runs over 50 ft. long and No. 12 wire on shorter runs. In general, circuits do not have more than 1,200 watts connected load. A typical class room of 445 sq. ft. has four 300-watt ceiling outlets while the offices have two such outlets. All offices and class rooms have convenient 100-watt receptacle outlets. Lighting fixtures are of the semi-indirect type with glass shades.

Preliminary studies were made to determine the feasibility of using a hot air heating system with provision for washing the air to provide humidification and reduction of temperature during the summer season. Due to lack of waste space in the building, necessary air ducts would occupy otherwise useful space to an extent that would interfere seriously with the interior arrangement. The added cost of providing duct space was not advisable; consequently, steam heat will be used. Radiators are to be supported on the walls.

All construction operations at the University of Colorado are under the direction of W. E. Brockway, supervising engineer. Charles Z. Klauder, of Philadelphia, is consulting architect. Associated with him is Glenn Huntington of Boulder, Colorado. Warren Raeder, associate professor of civil engineering and the writer prepared the structural plans for the building.

• • •

Mortgage Insurance Reaches All Time Peak

Mortgages entered upon the books of the Federal Housing Administration during the week ending March 5 reached the all-time peak of $17,530,000, administrator McDonald announced March 11. The previous peak was reached in the week ending March 20, 1937, when the total of mortgages selected for appraisal was $16,830,000.

Sand Traps for Sewers

Chambers built in sewers draining unpaved areas entrap grit which causes clogging

COMMUNITIES with unpaved streets are frequently troubled with sewer stoppages after heavy rains caused by accumulation of sand washed into storm drains. This results in temporary flooding of low areas and high maintenance costs for sewer cleaning.

A solution to the problem of removing grit is the sand trap, examples of which are those in use at Augusta, Ga., and Wilmington, N. C.

The trap devised by John D. Twiggs, assistant city engineer, Augusta, for a 5-ft. sewer is a brick chamber 15x20 ft. in plan, sufficient in depth to extend about 5 ft. below the flow line. The chamber is carried up to street subgrade where it is roofed over with I-beams supporting a concrete slab. Manholes are provided in this roof for access purposes. (Fig. 1).

Three sand traps are located at equally spaced intervals in the 3-mi. sewer line which drains an area in which there are many unpaved streets. Catch basins on these streets will hold only about 0.6 cu.yd. of grit and they are quickly filled and rendered useless in the early stages of a storm. Sand traps, holding about 50 cu.yd., remove the grit before it has an opportunity to accumulate and thus cause stoppages in the lower reaches of the sewer.

Traps of this type were tried experimentally on a 4-ft. drain and, according to Mr. Twiggs, have proven highly successful. They have eliminated flooding and manhole cover blowoff, and minimized sewer cleaning operations. Accumulations of sludge and grit are removed from the traps with a sand pump about once a year.

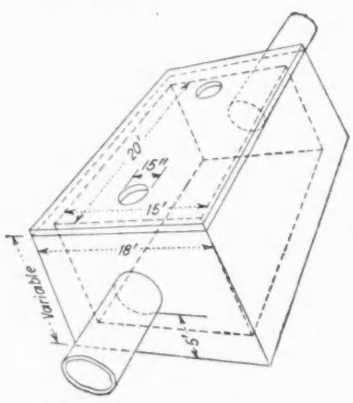


Fig. 1. Design of sand trap.

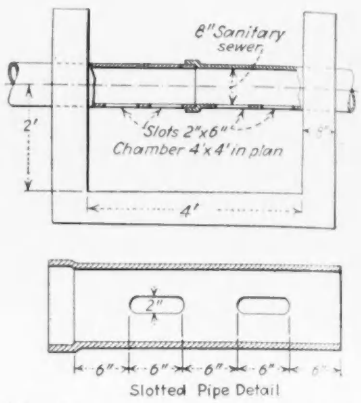


Fig. 2. Sand trap with slotted pipe eliminates scum clogging.

Wilmington trap design

At Wilmington, N. C., McKean Maffitt, superintendent of water and sewers, has designed a sand trap for use on sanitary sewers. In this place, because of flat topography and proximity to tidal water, sewer grades are very flat and it is essential that grit be removed to minimize stoppages.

The trap is a chamber 4x4 ft. in plan and 2 ft. in depth below the center of the pipeline. Through this chamber is carried the sewer pipe in the bottom of which slots 2 in. wide and 6 in. long have been cut. The slots permit grit to drop through and since they are submerged, no scum can clog them. The slotted pipe through the chamber is an improvement over a trap that has only inlet and outlet holes, the latter of which frequently become clogged with scum.

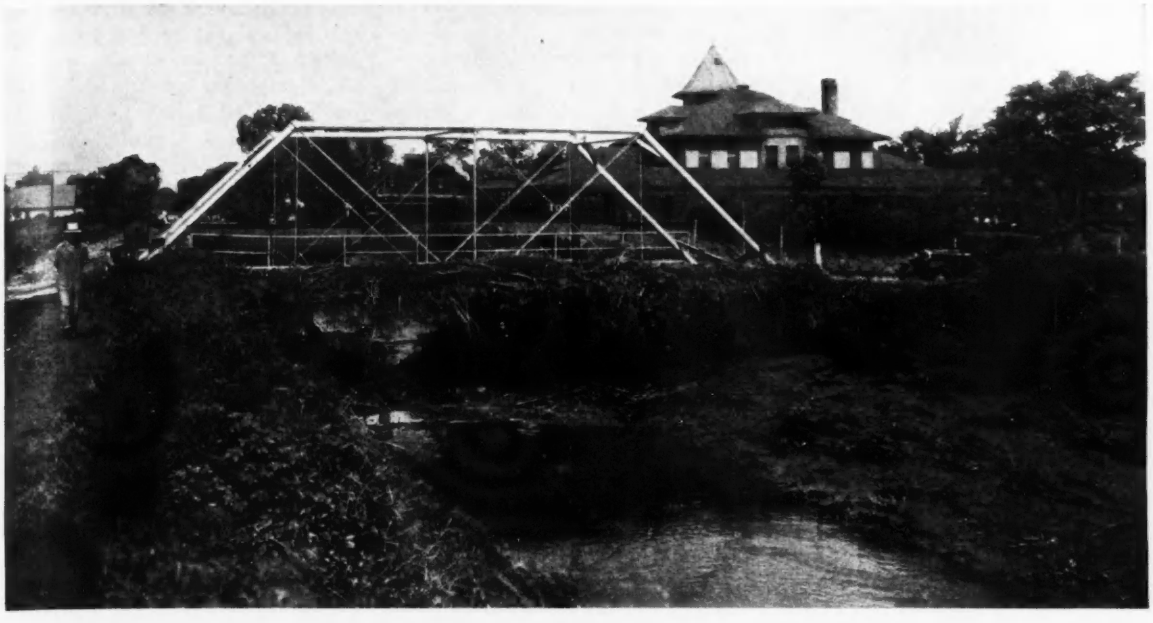


FIG. 1. INDIAN CREEK PERIODICALLY WAS A FIRST-CLASS FLASH FLOOD NUISANCE IN COUNCIL BLUFFS

Putting a Creek In a Conduit

by CHARLES B. BURDICK
Alvord, Burdick & Howson, Engineers, Chicago

Age-old floods in Council Bluffs from Indian Creek have been abated by doubling channel capacity and covering it for use as parking area

FOR more than 60 years Indian Creek has been flooding Council Bluffs, Iowa. For that long the problem of the control of this normally dry stream coursing down from the bluffs back of the city has been debated and numerous reports have been made on the subject by engineers. Losses have been great, totalling more than a million dollars in the last quarter century. In fact the average annual loss was found sufficient to finance the entire cost of improving the channel. The project involves 7.1 miles of channel improvement of which 3 miles is an earth channel excavated in the bottom lands below the city, and the remainder through the city and railroad yards is a concrete-lined channel, covered in the business district.

Council Bluffs lies on the east bank of the Missouri River opposite Omaha, Neb. The easterly part of the city, which is residential in character, is located on the bluffs which border the river bottoms. Indian Creek, which has a drainage area of 10.66 sq. miles above Bryant St. where it emerges from the bluffs, rises in the hills north of the city, flows through a high class residential district and emerges upon the flat; then it flows through the business district of the city only one-half block north of Broadway, the principal business street.

It then turns south for 1 mile through a congested railroad district serving the terminals of seven railroads. In this section the channel is crossed by 23 bridges most of which are railroad bridges. The total number of bridges spanning the channel throughout the length of the improvement is 61. Many of these bridges are permanent in character and a major part of the problem of design consisted in accommodating the channel between the abutments of these bridges and beneath their floors.

Above Bryant St. the Indian Creek watershed is quite steep and the capacity of the channel is very great, the banks being formed by the adjoining hills. Through the business district and the railroad district, however, the water-carrying capacity of the channel has been less than one-half that of the channel capacity necessary to accommodate past floods. As a result the lower part of the channel has overflowed with every heavy rain, sometimes twice a year, submerging the lower part of the business district and the railroad district and depositing large quantities of silt upon the streets, and in many of the stores and residences that occupy low ground. The area subject to flood is 450 acres.

Going back over the records the city auditor found $1,098,620 expense directly attributable in 26 years to the floods of Indian Creek. The

annual average of $42,250 is 3 per cent on the construction cost of the project, or 5.6 per cent of the city's share; PWA furnished 45 per cent. The audit does not take into account private losses and clean-up expense to say nothing of the restricted development of the city.

Capacity determination

Throughout its length the channel is designed to carry 6,000 sec.-ft. with a freeboard of about 1 ft. below the top of the walls. This is equivalent to 560 sec.-ft. per square mile from the 10.66 sq. miles above Bryant St. The drainage area is 9.23 sq. miles above the city limits at the upper end of the channel improvement. Below Bryant St. only a nominal amount of drainage enters.

In the preliminary study in 1920 a careful inquiry was made to determine the magnitude of past floods. At that time there was a good opportunity to determine floodflow through a previously constructed section of culvert or channel way in which the elevation of the flood waters had been noted, along with observations of velocity. Although the velocities were not determined in the greatest of the floods two observations were taken in comparatively large floods.

From these data it was possible to draw a fairly accurate velocity curve. This study indicated that there had been about a dozen floods in the preceding 20 years causing serious overflow in the business district and that the three largest ranged in magnitude from 3,000 to 3,400 sec.-ft. peak flow.

Rational formula applied

A separate study of floodflow rate was made by a rational formula in order to determine the probable floodflow rates of the future when city improvements would be more extensive. Knowing something of the rainfall that caused certain floods in the past, the character of the surfaces that prevailed on the drainage area, and the peak rate of flow through the culvert, it was possible to secure in the aggregate a general check on the coefficients of runoff to be applied in the floodflow formula.

This study indicated that under the conditions of the drainage area as then existing the time of concentration was 96 min. for the whole area and 27 min. for the area within the city taken separately. With an improved channelway the latter would be reduced to 18 min. upon the assumption that all territory within the city would some day be highly improved with a district residential in character. With a rainfall rate averaging 1.8 in. per hour for 96 min. and a floodflow of 3,410 sec.-ft. at the peak runoff, coefficients of 0.52 for the improved residential area and 0.26 for the rural area were indicated.

The study further indicated that the improved area within the city limits constituting only 13 per cent of the total drainage area is capable

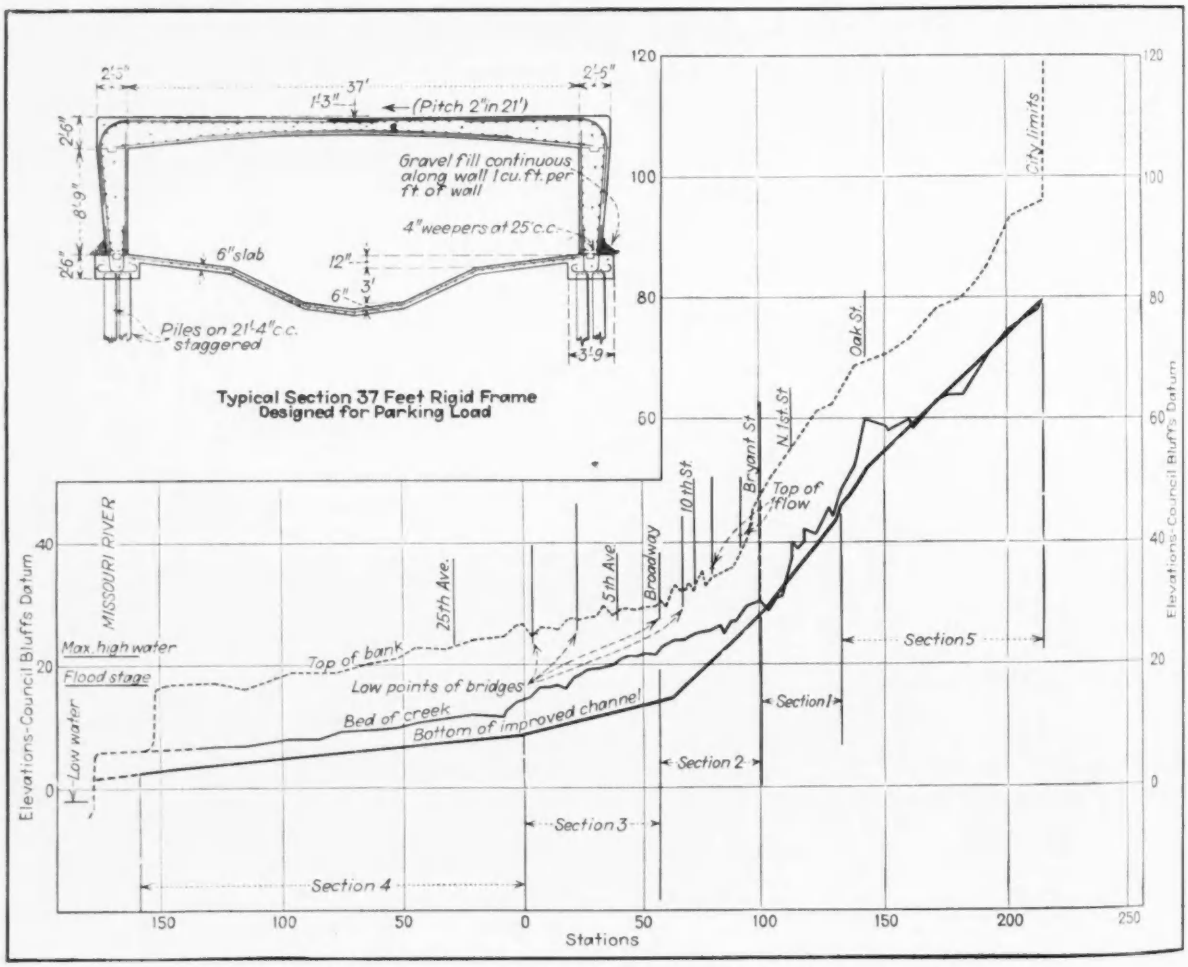


Fig. 2. Channel design was fitted to bridge spans existing at all street crossings.

of producing a flood 70 to 80 per cent as great as the peak rate of flow from the total area concentrating at Bryant St.

The best information available at this time indicates that the provisional flow for the channel of 6,000 sec.-ft. provides a margin of about 75 per cent to cover floods in the future that may be larger than the floods of the past.

Project units

The project was divided into five sections, each of which was covered by a separate contract, namely:

Sect. 4—This downstream section is an earthen channel having a bottom width of 80 ft. For the most part it traverses agricultural land between the city limits and the Missouri River. The excavation, amounting to 534,000 yd. was made with draglines which cast the excavated material into embankments which parallel the channel.

Sect. 3—This is a concrete-lined floodway, through the railroad yards, with vertical sidewalls and with bottom sloping to the center of the floodway better to handle small flows. This channel is 42 ft. in width between the faces of the vertical side walls which are 10 ft. high. The width of the channel is varied slightly to accommodate the abutments of the existing railroad bridges many of which are used as sidewalls for the channel under the bridges. The cross section of the channel was maintained as nearly uniform as possible in order to avoid changes in velocity and consequent loss of head. This required narrowing the waterway slightly in a few cases. This section of channel is closely paralleled on both banks throughout most of its length by transfer tracks of the Illinois Central and Burlington railroads.

Sidewall design

Sidewalls are designed as vertical beams of the cantilever type. The footing projections into the channel are utilized as a part of the bottom pavements. Horizontal thrusts against the walls allow for the small surcharge and the superimposed load due to railway traffic. The walls are supported on piles. All concrete is suitably reinforced with steel. Although this is an open channel, foundations and sidewalls have been

Fig. 3. In railroad yard area 10-ft. high walls are 42 ft. apart.

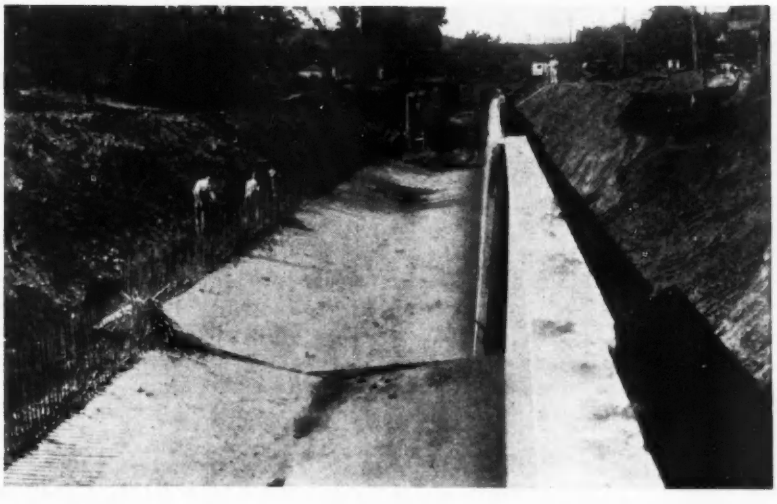


Fig. 4. Floodwater back of wall during construction moved structure sideways.

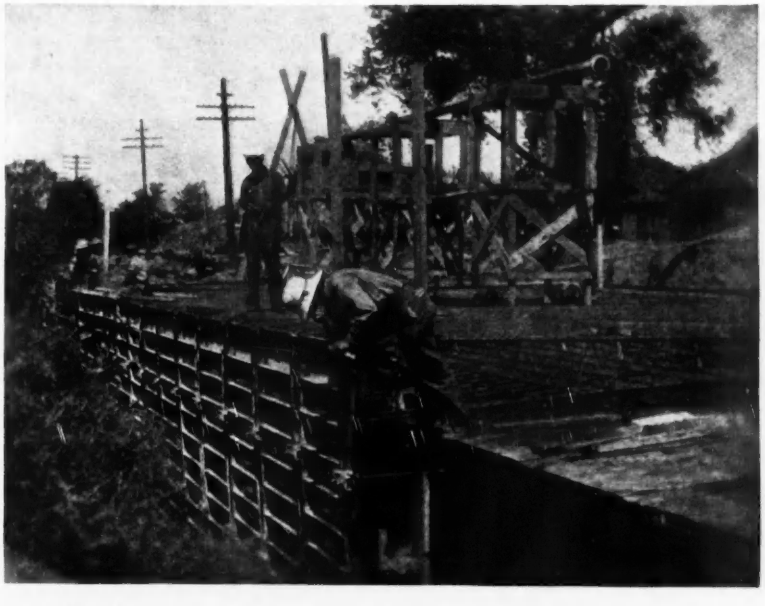


Fig. 5. Forms for box section were erected from traveler on invert.

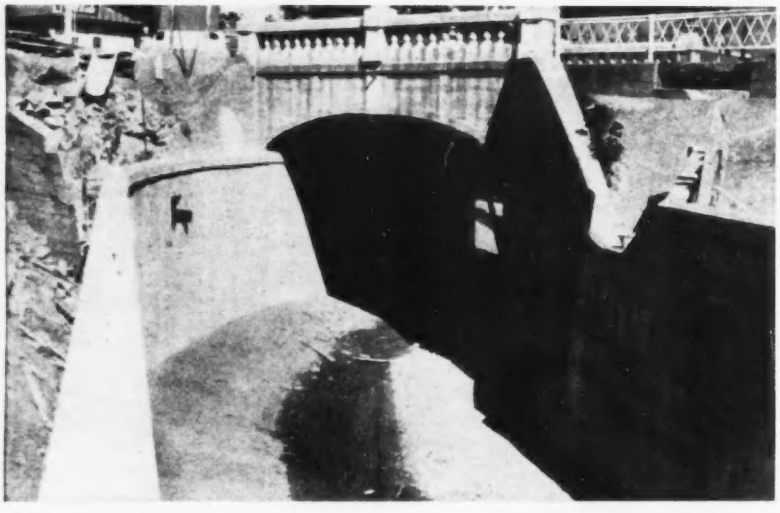


Fig. 6. Fall of creek is steep at upper end. Bridge interferences are numerous.

designed to support a concrete slab cover if this should ever become desirable in the future.

Sect. 2—This portion, 4,180 ft. long, is the city section and parallels Broadway, the principal east and west artery of the city, one-half block north. It is a covered waterway of rigid-frame construction, 30 ft. wide between 8¼-ft. vertical sidewalls. The roof of the channel is designed for H-15 highway bridge loading and is to be used for parking space by patrons of business houses along Broadway.

Between 6th St. and Bryant St. the channel has been inclosed with concrete walls and roof for a number of years, and the improved channel connects with this old improvement at the upstream and downstream end. The present project includes a new concrete bottom in this old waterway.

Sect. 1—This extends 3,188 ft. above Bryant St. and also is a covered waterway rectangular in cross section with the bottom slightly depressed towards the center of the channel to concentrate low-water flows. The width of the channel between the 13-ft. vertical sidewalls is 20 ft.

Sect. 5—This is an open channel. 22 ft. in width with 13-ft. vertical sidewalls. It is 8,334 ft. in length and extends from the upstream end of Sect. 1 to the north city limits paralleling and immediately adjacent to upper Broadway, the main artery into Council Bluffs from the north. The bottom of this channel slopes slightly toward the center and forms the footings for the sidewalls which are designed as vertical cantilevers.

Loess stands up

The high lands forming the easterly bank of the Missouri River consist of a geological formation known as "loess." This material has the general nature of a very fine clay. Dried and sifted about 60 per cent will pass through a 200-mesh sieve. As found undisturbed in the hills it has a cementing quality. Banks many feet in height will stand vertically for years with comparatively little weathering.

In consequence throughout the Indian Creek improvement practically no sheeting or bracing was required. With few exceptions the banks stood under a vertical cut even though the channel was flooded several times during the construction period. The exceptions were in cases where artificial filling had been done.

Pile foundations used

Where the water-deposited loess is constantly wet as in the bottoms it makes a foundation of uncertain bearing capacity, particularly where mixed with fine sands and silt deposited by the Missouri River. Throughout Sect. 2 and 3, in the business district and the railroad district, bridges have been supported largely on pile foundations. Pile foundations were adopted for the walls of the Indian Creek improvement. Wooden piles, 20 ft. in length, were designed to carry a load of 15 tons per pile. Occasionally it was necessary to drive piles to an additional depth or to provide additional piles to secure a safe bearing power.

Concrete generally was of 1:2½:4 mix with a maximum of 6½ gal. of water per sack. Test cylinders after 28 days showed an average compressive strength of 3,248 lb. per sq. in.

Transverse construction joints extending entirely across the channel were provided at 50-ft. intervals. Weep holes into the channel were provided at the faces of the wall backed by 1 cu. ft. of gravel per running foot of wall. On the covered sections of the channel steel sliding dowel pins were provided to transmit the roof loading from section to section at the expansion joints.

Forms on traveler

On Sect. 1 and 2 concrete was mixed in a portable mixing plant delivering concrete a maximum distance of 1,000 ft. by pumping. On these sections sectional steel forms were used set from a traveler running on rails on the bottom of the finished channel. On this part of the work, and elsewhere, the bottom was built first and concrete kept from 300 to 500 ft. in advance of wall and roof concrete. Roof forms and sidewall forms were supported by steel trusses set, taken down and moved forward by traveler.

On Sect. 3 and 5 concrete was delivered to the forms in trucks. On Sect. 3 a central mixing plant was used and this plant was also used in mixing the concrete for the lower part of Section 5, in which the haul was 2 miles.

Normally Indian Creek is dry and water flows only after a heavy rainfall. Floods rise quickly and subside quickly. There were several of these flash floods during the period of construction. On Sect. 5, which is an open section with floor and sidewalls rigidly connected with the 20-ft. channel floor, a late fall flood caught the construction with the bottom and only one sidewall complete. Backfilling had not been done. This method of construction had been adopted in order to secure quick support for the adjacent Broadway pavement.

Since there was inadequate drainage for the water coming down from the hills the surplus was impounded behind the wall. As the floor had no

support on the opposite side of the channel, about 600 ft. of wall and bottom was shoved out of alignment from 3 to 30 in. As the concrete had thoroughly set it sustained no injury except slight spalling at the construction joints. These wall sections were successfully jacked back into place. Each 50-ft. section was handled separately. This operation was a particularly skillful piece of work for it was necessary to correct alignments and grades at four places, namely the top of the wall, the bottom of the wall, the center of the channel and the wall footing for the sidewall not yet in place. A battery of 20-ton jacks spaced 18 to 24 in. on centers was set and braced against blocking on the opposite bank at the level of the floor. As the wall came back it was lifted by jacks set on blocking under the wall. Cables and winding drums were tried for this purpose but proved unsuccessful.

Costs and personnel

Certain average unit costs of the project are as follows: Excavation, 26.2c. per cu. yd.; concrete, $14.33 per cu. yd.; reinforcing steel, $60.45 per ton; reinforced concrete, $19.29 per cu. yd.; 20-ft. wood piles, $12.22 each; total cost of 37,527 ft. of channel, $1,367,190 or $36.43 per lin. ft. which includes some $90,000 for railroad changes, guard fences and miscellaneous items.

The Indian Creek improvement was designed and supervised by Alvord, Burdick & Howson, engineers of Chicago, working under Jack Boyne, city engineer. W. W. Mathews was resident engineer. The work was done under a city bond issue and 45 per cent PWA grant. It was subject to the approval of P. F. Hopkins, acting state director PWA, Leslie D. Gates, state engineer inspector and James H. Curtis, resident engineer inspector.

Construction, involving 50,683 cu. yd. of concrete and 807,600 yd. of excavation, began in March 1936 and was completed nine months later. Sections 1 and 2 were built by Union Construction Co. of Des Moines, Ia. All other work was done by local contractors. John Kerns Construction Co. had Section 3 and 4. Section 5 was executed by the Public Works Construction Co. On the upper portion of Section 5, E. A. Wickham & Co. was subcontractor.

Steel Girder Suspender Link

THE DESIGN of the links used in suspending the central spans of steel-girder bridges has become more or less standardized in drafting rooms of the U. S. Bureau of Public Roads, using the form shown in the accompanying drawings. In repeated use of this design the Bureau has worked out several features that are convenient and effective. Construction detail of the bridge at Parker, Arizona, is shown below. This type of suspender link is most frequently used in long bridges where steel girders are arranged in the now-popular sequence of a suspended central section in every alternate span.

The Parker Bridge spans are 63 ft. long and alternate spans have suspended sections 47 ft. long. Provision is made for a 2-in. movement in the joints at either end of the suspended sections, these joints being the only expansion take-up in the entire 600-ft. length of bridge.

Essentially the links consist of steel bars with pin connections to webs of the abutting girders. Proper thickness of bearing steel is provided by plates riveted to the web where the pins come into bearing in the connection between link and web. Filler and cover plates are used on the web sections with projecting ends that permit the outer plates to move freely past the web of the adjoining girder end.

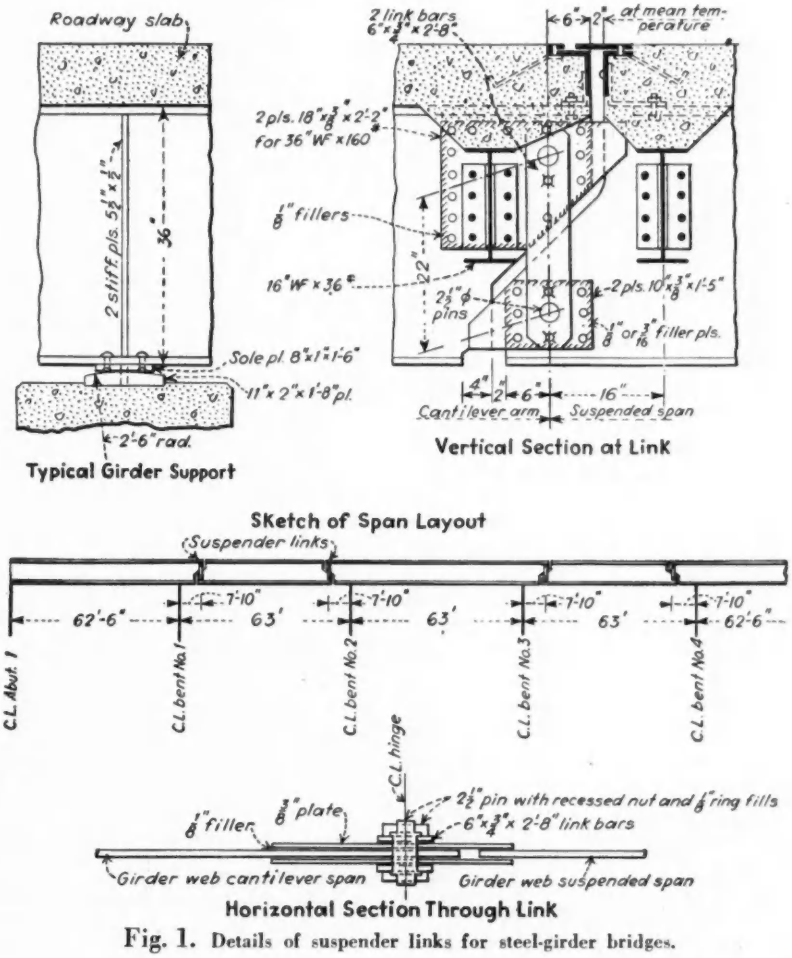


Fig. 1. Details of suspender links for steel-girder bridges.

FROM FIELD AND OFFICE

Working problems and time-saving methods . . . Edited by Charles S. Hill

Self-Service Road Sanding

by CHARLES T. FISHER
Albany, N. Y.

During the winter there are, in New York state, maintenance crews constantly on duty to keep the principal roads of the state system sanded whenever the pavement becomes icy, but there is sometimes an unavoidable period of slippery traveling after a storm before the sand trucks can cover their routes. For

Roadside stocks of sand help New York motorists fight ice on pavements.

emergency use during this interval, the state department of public works engineer in Schoharie County, W. C. Ruland, places oil drums filled with a mixture of sand and calcium chloride at short intervals along the shoulder of the road. Most motorists prefer shoveling a little sand to putting on tire chains, and truck drivers, especially those traveling at night, often save time by so helping their loads up the hills.

• • •

Egg Beater for Soil Samples

Mixing soil samples for laboratory tests is simplified by using a motor-driven beater or mixer of the type sold for kitchen use, according to Robert R. Ashline, electrolysis engineer, Los Angeles Department of Water and Power. About 1500 individual samples have been mixed by the motor-driven mixer in making soil tests conducted by Mr. Ashline, largely for determining the relative corrosivity of soils as in the preparation of samples for tests by the Corfield-Williamson nipple-and-can method, or in the galvanic electrolysis of thin metal sections. The average time required for mixing a sample is about 5 min. The soils tested range from fine sands to the heaviest clay and adobe. Experience shows that the motor on this type of mixer gives satisfactory service under continued operation with a heavy load.

Mixers of this type will be a saving, Mr. Ashline suggests, wherever an even, smooth mixture of soil is required and also may be useful in sieve analyses of materials used in earthfill dams. The standard beater sold with this equipment for kitchen use was not satisfactory because of the excessive wear of the bearing immersed in the materials under test. This trouble was overcome by designing a beater that has no bearings in contact with materials being mixed. To speed the action and to give a cutting effect, the leading edges of the beater blades are sharpened.

Improved mixer which eliminates bearing exposed to abrasive action in mixing samples.

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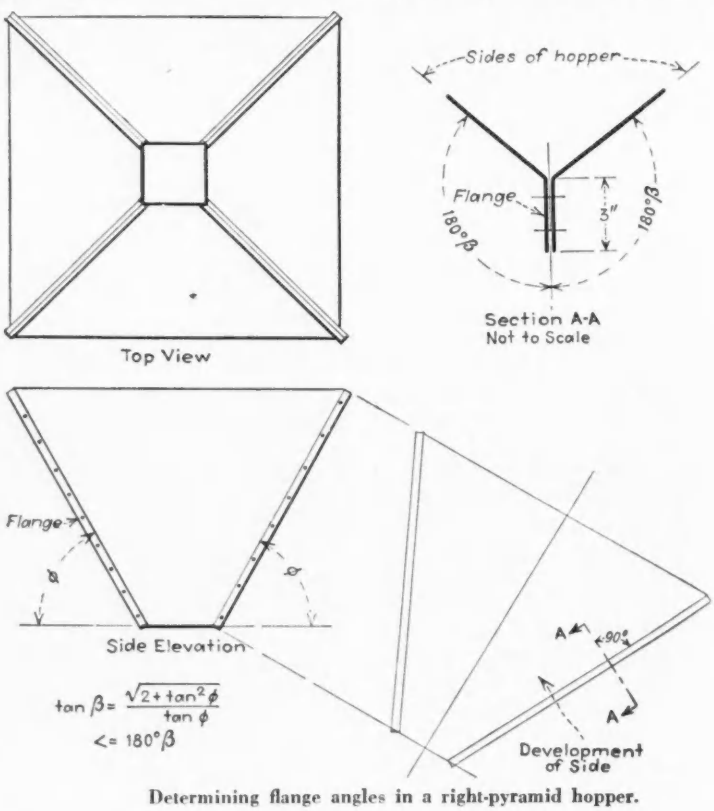
Formula for Flange Angles

by HERBERT SIMON
Principal Assistant Engineer, Department of Public Affairs, Newark, N. J.

In connection with the design of a sheet steel sand hopper, I have deduced a formula which has a practical application and may be of interest to some readers. The formula applies only in cases where the hop-



Determining flange angles in a right-pyramid hopper.

per, or bottom of the hopper, conforms to the shape of an inverted truncated right pyramid, with all four sides making an angle ϕ with the horizontal.

As designed, the converging edges of each of the four sheets used in the construction will have a flange about 3 in wide, formed by bending the edge of the sheet to such angle as will cause the flanges on adjacent edges to lie flat against each other to facilitate bolting and a perfectly tight joint.

To make up a template, or to lay out an angle for the blacksmith to use as a guide in bending the edge of the sheet, the following formula may be used:

$$\tan \beta = \frac{\sqrt{2 + \tan^2 \phi}}{\tan \phi}$$

wherein ϕ = angle that the sides of the hopper make with the horizontal and β is the angular difference between 180 deg. and the angle desired. In other words, the angle that the flange will make with the sheet is 180 deg. — β.

• • •

Hooping Brush Fascines

Fascines of brush, with concrete cores, used in parts of brush bank revetment on western Washington rivers have to be hooped tightly with wire about every foot of length. As these fascines are usually several hundred feet long (*ENR* Nov. 4, '37 p. 759) and have trying service, the wire hoops must be strained into place to pull the brush into a tight roll and then tied firmly. Special tools designed for the hooping operation are shown by the accompanying illustration.

Hand tools for placing and fastening wire wrapping around a brush fascine.

Tools of two different types are used. The first type, used for drawing the wire taut, consists of two iron bars held together by a pin joint which permits one of the bars to hinge around the pin thus enabling the short end which terminates in a curved face, to wedge the wire tightly against the shoulder of the opposing bar. When the hinged handle is brought into line with the second part of the bar the wire is held tightly as in a clamp. The hinged part of the bar is the shorter of the two parts and serves as a handle. The other part is longer, has a pointed end, and is thrust down into the fascine before the handle is straightened.

Two men, each equipped with one of these tools as shown, pull the opposite ends of a wire encircling the fascine until the desired tension is secured. Then the tool of the second type comes into play for fastening the wire. This second tool, operated by the man in the center of the picture resembles a ratchet wrench. Once this wrench is gripped to the overlapping strands of wire held by the other two men, the fastening can be secured by simple operation of the ratchet and without changing the grip. A crew of three men using tools of these two types can make very rapid progress in completing the wire fastenings once the brush and concrete have been placed on the assembling yokes.

PLANE TABLE ON TRUCK

In surveying Columbia Basin flat lands the reclamation bureau engineers have found usefulness in mounting a plane table on the roof of the station wagon that transports the survey party. The survey is a part of the Grand Coulee project. The editor is indebted to F. A. Banks, Construction Engineer, Coulee Dam, Wash., for the illustrations.

Railroad Engineers Plan Research

American Railway Engineering Association to undertake new research into the relation of rolling stock to track and studies of rail joints and fastenings

RESEARCH into the major problems confronting railroad maintenance engineers is to be continued and expanded during 1938, despite the unfavorable financial conditions of the railroads. That announcement, made at the opening session of the 39th annual meeting of the American Railway Engineering Association by its president, J. C. Irwin, stands out as the most important happening of the convention. The principal new study to be undertaken is one into the relation between track and rolling stock which will be a continuation and enlargement of the work carried on during the past several years by the joint committee on stresses in tracks. The new study is to be headed by Arthur N. Talbot, chairman of the track-stress committee.

Mr. Irwin reported that the track-stress study is to be continued, as is the study of methods for improving rail manufacturing processes and the study of continuous welding of rail joints. G. M. McGee, recently appointed research engineer of the engineering division, Association of American Railroads, is now engaged in preliminary work for the enlarged track study. This work, said Mr. Irwin, will require a large amount of help from the railroads and the expenditure of a considerable amount of money. Subsequently, J. M. Symes, vice president, Association of American Railroads, stated that the A.A.R. had authorized the expenditure of $107,000 in 1938 for the work in which the A.R.E.A. is interested.

Other research planned is a study of means for reducing the damage to track and bridges due to brine drippings. Also projected is a field study of impact, but as the necessary equipment will be expensive the work cannot be financed at the present time. The special committee on impact is to continue its study of test devices that will be needed for the field work.

Progress on the several studies being carried forward by the rail committee in cooperation with other agencies was reported by the committee and by Prof. H. F. Moore, under whose direction much of the rail research is being carried out. The studies include end-hardening of rails, acceptance tests for rails at the mill, controlled cooling of rails during manufacture, and end-batter tests. The latter study, which is being conducted at the University of Illinois, has gone as far as possible in the laboratory and must be transferred to the field as soon as funds are available.

Prof. Moore stated that encouraging results are being obtained in eliminating shatter cracks (the source of transverse fissures) through controlled cooling of rails. Almost any reduction in rate of cooling has been found beneficial, and it is now possible to prescribe cooling rates below which shatter cracks will not develop.

Referring to the batter tests previously noted, Prof. Moore said that the tests all had been made with the rolling-load machine developed in the laboratory of the University of Illinois. This machine is slow moving and so cannot duplicate the effect of fast-moving loads. This effect must be studied in the field. However, the laboratory tests have shown that the Brinell hardness of specially treated rail ends must be within the limits of 300 and 450. Little improvement is found below 300 and scaling begins at about 450.

Mostly negative results have been obtained in efforts to develop a non-destructive mill test for rails, but experiments now are being made with a vibration test that appear to have possibilities for practical application.

Four methods of welding rails for continuous track are under study, but Prof. Moore states that it is too early to announce results. The methods used are two types of gas welding, Thermit welding, and electric butt welding by the Sperry method. The joints welded by these four processes are to be tested in the rolling-road machine at the University of Illinois.

Another subject under study is the type of fastening to be used with continuously welded rails.

On the subject of rails longer than 39 ft., the rail committee reports that it has found considerable interest in rails 78 ft. long. The Kansas City Southern has laid about 200 tons of 127-lb. rails in 78-ft. lengths. Periodic checks on expansion and contraction are being made.

Track stress committee

Arthur N. Talbot, chairman, reported on the work of the special committee on stresses in railroad track set up by the A.R.E.A., the Am.Soc.C.E. and the A.A.R., showing by slides some of the results obtained in the field work in which most of the party was engaged last year. The field data now are being analyzed and conclusions will be reported in the near future.

A modified section for the 130-lb. R.E. rail was submitted by the rail committee and adopted for the Manual. The principal change is in the head which is made more round on top and having corners that are less sharp.

Rail damage by locomotives

The subject of rail damage came up again in two papers that provided a serious climax for the gay dinner party given for the A.R.E.A. and the N.R.A.A. by the Western Railway Club. A. A. Miller, engineer maintenance-of-way of the Missouri Pacific, and B. F. Ellis, chief mechanical officer of the Chesapeake &

Ohio, spoke on "Rail Damage and the Relation of Locomotives Thereto." Mr. Miller listed the chief items of rail damage due to locomotives as: abrasion of the head of the rail, outward flow of metal on the surface of the rail, batter at rail joint, development of transverse fissures, burns on the surface, and surface kinks. The latter Mr. Miller considered most serious and characterized them as the result of overloading the rail as a beam, a direct outgrowth of the higher speeds of today which result in magnification of the effects of improper counterbalancing. In the past such kinking was not unknown but it invariably occurred at such regular intervals as to make it easy to determine the offending locomotive. Today there is no such regularity, indicating more than one source of the trouble.

This latter point was amplified by Mr. Ellis who pointed out that vibration of the revolving parts and of the track itself may result in harmonic impact loads of great magnitude when locomotives are operating at high speeds. Mr. Ellis said that the mechanical departments of the railroads have not kept up to the track departments in improving their product and urged the greater use of alloy steels as one way for reducing the effect of improperly balanced moving parts.

Buildings

Brief summaries of the several methods for insulating buildings were presented by the committee on buildings in its report. This committee also presented a report on methods now used to design buildings to resist earthquakes, including a bibliography of published material. The chairman stated that the committee's report was not to be considered a treatise on earthquake-resistant construction but simply an outline of the fundamental principles involved in such work.

Passenger terminals

Trends in passenger terminal design were reported by the committee on yards and terminals. The increasing use of private automobiles and taxicabs for movement to and from such terminals has made it desirable to provide more parking areas in new or redesigned stations than was considered necessary a decade or more ago. Increasing use of hand baggage in preference to trunks has led to a demand for better facilities for the expeditious movement of such baggage from cab entrances to trainside.

Vehicle size limits

Legal limits for the size of vehicles operating on highways were reviewed by the yards and terminals committee as part of its study of driveways in rail terminals. The limits set forth by each state are given in a table accompanying the report.

Brief conclusions as to the use of reinforced brickwork were presented by the masonry committee together with a partial list of recent publications on this subject. The committee also presented information on the characteristics and use of lightweight aggregate and on modern developments in cement. As to the latter, it states that the interrelation between water-cement ratio, strength, cement factor, and durability needs further study in connection with the higher temperatures resulting from the heat of hydration of the faster cements, and that the constancy of volume in the concrete must be studied in relation to the finer ground cement. "Promulgation of well seasoned consensus of opinion from deliberative sources as to what adjustments should be made for the use of present-day cement is needed," said the committee. It went on to recommend that the engineering research and advisory committee of the A.A.R. be urged by the association to include such a study of cements in its research program.

Specifications for pile foundations were submitted by the masonry committee for study pending their presentation next year for adoption in the Manual. Specifications for the placement of concrete by pumping also were included in its report, these to be substituted for similar specifications submitted last year. This committee presented for inclusion in the Manual specifications for concrete pipe which should be adhered to when it is necessary to purchase pipe not made to A.S.T.M. specifications.

Steel bridge specifications

Revisions of the specifications for steel railway bridges published by the association in 1935 were presented by the committee on iron and steel structures. These include a revision of the formulas for compression members. It was stated in discussion that the formulas for such members now in the specifications of 1935 give inaccurate results.

This committee recommended that the specifications for design, construction, alteration and repair of highway and railway bridges by fusion welding prepared by the American Welding Society be adopted by the A.R.E.A. and so recorded in its Manual. It put forward for inclusion in the Manual standard specifications for rivets one-half inch nominal diameter and larger. With reference to the welding specifications, the committee stated that those of the American Welding Society are the best available until more research has been carried out and it urged upon the association that it it contribute to the research now being conducted into welding procedure under the auspices of Engineering Foundation.

Railway location

For some time past the committee on economics of railway location has been studying the effect of modern motive power on future railway location work. This year it submitted valuable studies on the capacities and characteristics of steam and oil-electric locomotives, on electric locomotives and gas-electric rail cars for study previous to publication in the Manual. This supplements information on electric locomotives submitted last year. The committee also submitted a report on the effect of speeds in excess of 75 miles per hour on the economics of railway location. Included in this report is an interesting tabulation of high-speed trains operating in this country and Canada. Tables relating to transition curves on tracks over which high-speed trains are operated also are included in the committee's report.

The committee on economics of railway operation submitted a progress report on the coordination of railroad facilities, a subject which is much in the public eye at the present time. It also submitted a report on methods for determining the value of rise and fall, distance and curvature in minor line and grade revision, and a report on methods for determining

the most economical train lengths.

The committee on economics of railway labor contributed a valuable study of the use of extra gangs in maintenance of way work, also several studies of special types of gang work.

Of special note in the railway labor committee report is its emphasis on the need for recruiting and training capable and efficient men for foremen and junior supervisory officers.

Construction Equipment

Valuable data on the life expectancy and annual depreciation percentage of work equipment were given by the committee on maintenance of way work equipment. Included is a table of such equipment which contains many items used in general construction work. This committee also reported on portable power pumps describing briefly the characteristics of diaphragm, centrifugal and reciprocating pumps and reviewing briefly their most suitable applications.

Wood preservation

A progress report on long-time tests of timber exposed to attack by marine organisms was submitted by the committee on wood preservation, and the same committee submitted a report on the final inspection of termite soil poison tests that have been in progress at Florissant, Mo., since 1932. Soils were poisoned with 22 different compounds and small wooden posts driven into the ground were left for a 5-year period of exposure to attack by termites. Summarizing the results, Hermann von Schrenk, chairman of the subcommittee in charge of the study, stated that the results were surprising and left many questions open, especially that of how long such poisoning would be effective. Some poisons appeared to have been effective for a time, but the posts were under attack at the conclusion of the test, indicating that the poison was being leached away. Dr. von Schrenk said that the termite situation is getting progressively worse, that no state in the Union now is entirely free from termite attack, and he emphasized the need for proper construction methods if damage from termites is to be avoided.

BOOK NOTES AND REVIEWS

The month's additions to the engineer's reading and reference list

Arc-Welding Handbook

PROCEDURE HANDBOOK OF ARC-WELDING DESIGN AND PRACTICE—Fifth Edition, 1938. 1012 pp. Prepared and published by the Lincoln Electric Co., Cleveland, Ohio. Price, $1.50 in U.S.A., $2 elsewhere.

The fifth edition of this well-known handbook of arc-welding design and practice contains some 200 more pages than the previous edition. As previously, it is divided into sections covering such subjects as welding methods and equipment, welding technique, procedures, speeds and costs, structure and properties of weld metal, machinery designing, and structure designing. New or revised information is included on characteristics of the welding generator, standard weld symbols, welding costs, high-speed automatic welding, high tensile steels, cold rolled steels, filler metal specifications and structural design.

Snow Removal

MUNICIPAL SNOW REMOVAL and the Treatment of Icy Pavements—Preprint of Chapter 8 of the Manual of Street Cleaning Practice. Published by the American Public Works Association, Chicago. Price $1.

An advance printing in multigraphed form of one chapter of the forthcoming Manual of Street Cleaning Practice has been brought out in order to make the information quickly available to municipal officials charged with street maintenance. The pamphlet contains a study of practices in 78 cities and evaluates the various factors involved. The following topics are discussed: Policies related to the budget, preplanning of procedure, organization set-up, establishment of schedules and routes, arrangements for personnel and equipment, street railway and bus activities, snow fighting by contract, checking the operation, kinds of equipment, plowing practice, sidewalk service, sweeping, removal equipment, manual vs. mechanical loading, melting, disposal and supervision at dumping points, elimination of ice hazards and material-spreading equipment.

Hydraulic Laboratories

REPRESENTATIVE HYDRAULIC LABORATORIES in the United States and Canada—by Leslie J. Hooper. 240 pp. Published by the Boston Society of Civil Engineers as Section 2, No. 1, Vol. XXV of its journal. Price, $1.

NEW HYDRAULIC LABORATORIES AND THEIR WORK—by R. Ruedy. Published by the Division of Research Information, National Research Council, Ottawa, Ont., Canada. Price, $1.

A large amount of information relating to the equipment of hydraulic laboratories in this country and in Canada is contained in Mr. Hooper's paper. Mr. Ruedy's paper is a compilation of descriptive matter relating to laboratories and their work published in technical journals around the world. Supplementing the material contained in these two reports is Hydraulic Laboratory Bulletin VI of the National Bureau of Standards, Washington, D. C., giving a listing of the current hydraulic laboratory research in progress in laboratories in this country.

An Aid to Computation

SEGMENTAL FUNCTIONS — Text and tables. By C. K. Smoley. 184 pp. Published by C. K. Smoley & Sons, Scranton, Pa. Price $5.

This new handbook will be welcomed by all structural engineers, surveyors and others who need to compute the elements and areas of circular segments. The principal table is one of logarithms of segmental functions given directly for intervals of one minute in a central angle from zero to 180 degrees, and with proportional parts for seconds. In addition, there are six small tables, two of which reduce the work of interpolation to secure a higher degree of precision within certain limits; two others deal with lengths of circular arcs and areas, both for

a radius of unity; a fifth table contains the functions of the segments formed by regular inscribed polygons, and the sixth table is designed to facilitate the laying out of circular curves. To make the book complete in itself, certain tables are reprinted from the author's earlier books.—*Reviewed by* HENRY S. JACOBY, *Washington, D. C.*

Pile Driving Data

RESISTANCE OF PILES TO PENETRATION—By Russell V. Allin. 130 pp. Published by E. & F. N. Spon, Ltd., London. Chemical Publishing Co., New York. Price $4.

This book contains tables that give the resistance of piles to penetration as determined by practical application of the Hiley formula. The author is careful to discriminate between the resistance of piles to penetration under the blows of the hammer and the bearing value of the piles in a foundation. It is left to the engineer to determine from his knowledge of the soil what the relation is between the permanent static resistance of the pile or the carrying power of the soil to which the load is transmitted, and its kinetic resistance to driving.

The author points out that most rational formulae for obtaining the resistance of piles to penetration are derived by equating the energy of the hammer in falling through the distance of its drop with that exerted by the ultimate resistance of the ground acting through the distance of the final set, plus losses of energy in driving. These losses consist in (a) overcoming the inertia of the pile, (b) temporarily compressing the pile (with dolly and cushion) and the soil (c) losses in the hammer mechanism.

The author selected the Hiley formula as the most suitable for his tables of resistance and expresses the opinion that this formula has been demonstrated to be theoretically sound. The formula is:—

$$R = \frac{NWH}{S + \frac{C}{2}}$$

R = ultimate resistance to penetration of pile in tons
W = weight of hammer in tons
S = final set in inches
H = fall of hammer in inches
C = the temporary elastic compression, expressed in inches, of the pile, helmet, dolly, material forming the cushion, and also the soil.
N = efficiency of the blow determined from the coefficient of restitution of materials under impact.

The author discusses factors that enter into this formula and illustrates their application by practical examples, including such matters as the temporary compression for the pile, the effect of ratio of hammer weight to pile weight, and the coefficient of restitution.

The tables themselves apply to typical cases from 12x12 in. timber piles up to 24x24 in. concrete piles, of lengths from 10 ft. to 120 ft., and with hammers weighing from ½ to 10 tons, and heights of fall from 1 ft. 6 in. to 4 ft. 6 in., and with final sets of 3 in. to 1/40 in. per blow. Round piles are not included.

The author points out the usefulness of the tables not only in determining the resistance to penetration of a pile as driven but also in selecting piles and driving equipment to give efficiency. Particularly important is the selection of the most suitable weight of hammer and fall in order that the useful energy of the hammer may bear a correct relation to the various losses in driving.—*Reviewed by* R. E. BAKENHUS, *Consulting Engineer, New York.*

Structural Frames

STATICALLY INDETERMINATE FRAMEWORKS—By Thomas F. Hickerson. 205 pp. Published by the University of North Carolina Press, Chapel Hill, N. C. Price $3.

This scholarly treatise is a revised and enlarged edition of "Structural Frameworks," reviewed in *Engineering News-Record*, Sept. 27, 1934, p. 409. Much of the earlier book has been rewritten, many figures have been redrawn and others added, the 60 pages of additional text are of vital importance, with the result that we have practically a new book. It may be noted that the analysis of continuous beams and frames is for (a) no sidesway and (b) full sidesway. Appendix A gives 82 tables accompanied by diagrams, explanatory text and numerical examples that are of special value to the designer of concrete structures. Appendix C has the heading, "Tall Building Frames Subjected to Wind Forces: Analysis by Approximate Methods." Of the three methods shown, "A" and "B" are the conventional "cantilever" and "portal" methods. Method "C" assumes rigid connections of girders to columns, practically "fixed ends," also that the unit direct stress in a column is proportional to its distance from the neutral axis of the columns in the bent. In Appendix D, beam coefficients and load coefficients are evolved for members with (1) symmetrical straight haunches, (2) full parabolic haunches and (3) uniformly varying depth. The book merits great praise and is recommended for study. It can hardly be called easy reading, but Professor Hickerson writes with clearness and makes himself understood. — *Reviewed by* ROBINS FLEMING, *American Bridge Co., New York.*

MISCELLANEOUS NOTES ON BOOKLETS AND REPRINTS

A BIBLIOGRAPHY of articles on Highways and Motor Transport has been published by the National Highway Users Conference, under date of Dec. 1, 1937. Copies may be obtained from the conference office, National Press Building, Washington, D. C., without charge to specially interested parties.

LOW COST HOUSING for the lower income group has been analysed by George F. Lindsay, First National Bank Building, St. Paul, Minn., in a pamphlet recently published in mimeograph form. After reviewing various phases of house construction, the author concludes that standardization is the first approach to lower costs, and in the second half of the monograph suggests the possibility of 50 per cent cost reduction by this means.

MONTHLY EARNINGS of Professional Engineers, the seventh of a series of articles to be published in the *Monthly Labor Review* as an outgrowth of the survey of the engineering profession made by the U. S. Department of Labor, has been published as Serial No. R 659. An article on educational qualifications was published in June, 1936; articles on

unemployment, employment and security of employment were published in January, April and May, 1937; two articles on income were published in August and September, and the present article in November. Copies of the articles may be obtained from the Bureau of Labor Statistics, U. S. Dept. of Labor, Washington, D. C.

ACCOMPLISHMENTS OF THE WPA in New York City have been made the subject of an illustrated pamphlet published by the WPA.

A HANDBOOK on the use of copper tubes in plumbing and heating work has been prepared and issued by the Copper and Brass Research Association, 420 Lexington Ave., New York.

RECOMMENDATIONS made to the City of Knoxville, Tenn., with respect to establishing agencies for the solution of the city's traffic problem are contained in a report of traffic committees of the Technical Society of Knoxville, Tenn.

A NOTEBOOK containing the Outlines and Lectures presented at the first traffic engineering school held under the auspices of the Harvard Bureau of Street Traffic Research in August, 1937, has been published by the bureau at Cambridge. Price $1.

ARCHITECTURAL ACOUSTICS, an enlargement of an earlier circular on the same subject, has been published as Circular C-418 of the National Bureau of Standards. It supercedes C-396. Copies may be obtained from the Superintendent of Documents, Washington, D. C. Price, 5 cents.

MOSQUITOES—Their Life History and Control, is the title of an informative booklet published by the Nassau County (N. Y.) Extermination Commission. Copies can be obtained free by addressing R. H. Sammis, 75 Lee Ave., Rockville Centre, N. Y.

TESTS TO DESTRUCTION of Steel Rigid Frames is the title of Progress Report No. 10 published by the American Institute of Steel Construction, 200 Madison Ave., New York. The tests described were made in the National Bureau of Standards.

HIGHWAY BRIDGE SURVEYS, a pamphlet prepared by C. B. McCullough in cooperation with the Bureau of Public Roads and originally published in 1928 as Technical Bulletin No. 55, U. S. Department of Agriculture, has been reprinted and is now available from the Superintendent of Documents, Washington, D. C. Price, 20 cents.

A NEW HIGHWAY MAGAZINE called "Caminos" has begun publication in Mexico City (5 de Mayo, 29 Despacho 207; $6 Mex. per year). It is to be published bi-monthly, the January-February issue being the first. The magazine, written in Spanish, is to be devoted to problems of highway administration, design, construction and research.

NEW PUBLICATIONS

PRINCIPLES AND PRACTICE OF SURVEYING—Vol. I, Elementary Surveying. Vol. II, Higher Surveying. By Charles B. Breed and George L. Hosmer. 674 pp. Published by John Wiley & Sons, New York, Chapman & Hall, London. Price $4.00 and $3.50 respectively.

THE A B C OF MUNICIPAL BONDS—By Louis S. Lebenthal. 166 pp. Published by Harper Brothers, New York. Price $1.50.

MOTORWAYS, FLYOVERS AND MOUNTAIN ROADS—By F. G. Royal-Dawson. 176 pp. Published by E. & F. N. Spon, Ltd., 57 Haymarket, London S. W. 1, and Chemical Publishing Co., New York. Price $3.50.

HOW TO KEEP ACCOUNTS AND PREPARE STATEMENTS—By Earl A. Saliers. 481 pp. Published by the Ronald Press Co., New York. Price $3.00.

HEATING, VENTILATING AND AIR-CONDITIONING FUNDAMENTALS — By William H. Severns. 467 pp. Published by John Wiley & Sons, New York. Chapman & Hall, London. Price $4.00.

VAN NOSTRAND'S SCIENTIFIC ENCYCLOPEDIA—1,234 pp. Published by D. Van Nostrand Co., New York. Price $10.00.

HOW TO FILE BUSINESS PAPERS AND RECORDS—By Allen Chaffee. 186 pp. Published by McGraw-Hill Book Co., Inc., New York and London. Price $2.00.

INVENTIONS AND THEIR PROTECTION—By George V. Woodling. 326 pp. Published by Penton Publishing Co., Cleveland. Price $5.00.

NATIONAL FIRE CODES FOR FLAMMABLE LIQUIDS AND GASES—1938—Compiled by Robert S. Moulton, Technical Secretary, N.F.P.A. 360 pp. Published by the National Fire Protection Association, Boston, Mass.

PORTS OF SOUTHERN NEW ENGLAND—Port Series No. 18, revised 1937. Prepared by the Board of Engineers for Rivers and Harbors. 404 pp. For sale by the Superintendent of Documents, Washington, D. C. Price $1.50 (paper cover).

CONSTRUCTION DES LIGNES DE CHEMINS DE FER IRMAK-FILYOS & FEVZIPASA-DIYARBEKIR — 209 pp. Published by Nordquist & Holm Trollhattan, Sweden; J. Saabye & O. Lerche, and Kampmann, Kieruff & Saxild, Copenhagen, Denmark.

REPORT ON STEEL PIPE LINES FOR UNDERGROUND WATER SERVICE—100 pp. Published by Underwriters' Laboratories, Inc., Chicago.

AMERICA'S STAKE IN INTERNATIONAL INVESTMENTS—By Cleona Lewis, assisted by Karl T. Schlotterbeck. 710 pp. Published by the Brookings Institution, Washington, D. C. Price $4.00.

THE INCOME STRUCTURE OF THE UNITED STATES—By Maurice Leven. 177 pp. Published by the Brookings Institution, Washington, D. C. Price $1.50.

SEEHAFENBAU — Lieferung 4 and 5, Band II. By F. W. Otto Schulze. Pp. 241-400 incl. Published by Wilhelm Ernst & Sohn, Berlin, Germany. Price 4.15 and 4.10 RM, respectively (paper cover).

REPORT OF THE ROAD RESEARCH BOARD—For the Year Ended 31st March 1937. 120 pp. Published by His Majesty's Stationery Office, London. Price 3s.

PROCEEDINGS OF THE FORTIETH ANNUAL MEETING, American Society for Testing Materials—Vol. 37, 1937; Part I, Committee Reports, Tentative Standards; Part II, Technical Papers. 2072 pp. (2 vols.). Prepared and published by the American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa. Price on application.

INDEX TO A.S.T.M. STANDARDS AND TENTATIVE STANDARDS—Jan. 1, 1938. 128 pp. Prepared and published by the American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa.

PROCEEDINGS OF THE PUNJAB ENGINEERING CONGRESS, 1937—190 pp. Published by the Punjab Engineering Congress, P. W. D. Secretariat, Lahore, India.

REINFORCED CONCRETE PAVEMENTS—By Royall D. Bradbury. 190 pp. Published by the Wire Reinforcement Institute, Washington, D. C.

THE WEEK'S EVENTS

Continued from page 457

Aqueduct Financing Is Completed

Financing of the initial development of the 392-mile Colorado River aqueduct has been completed with acceptance by the board of directors of the Metropolitan Water District of Southern California of the bid of the Reconstruction Finance Corp. for the purchase of $60,000,000 of Colorado River waterworks bonds. This sale brings the amount of bonds already sold to the RFC to $207,000,000, while $1,500,000 has been sold to PWA.

The bonds sold are a part of the $220,000,000 issue approved in September, 1931 by water district voters. The bonds are payable in 50 years, with the first installment on principal becoming due fifteen years after the date of sale. All bonds sold to RFC bear interest at 5 per cent, though the corporation is making a 1 percent refund to the district until April 1, 1939.

Present estimates indicate that the aqueduct system will be completed within its estimated cost and that the $220,000,000 bond issue will provide sufficient funds to construct additional features not included in the original estimate.

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Strength of Materials Study Planned at M.I.T.

A special summer conference on the strength of materials has been arranged at the Massachusetts Institute of Technology to be held in the four weeks beginning June 13. The program is offered by the department of mechanical engineering.

Three concurrent series of lectures will be held, a series on timber, a series on concrete, and a series on strength problems. In addition, laboratory exercises on the strength of materials will be held each week and two seminars, one on the analysis of statically indeterminate structures and the other on basic ideas on strength of metals, will be held during the conference.

The program will be concluded by two all-day conferences on timber and concrete at which various aspects of these two subjects will be discussed by experts.

Massachusetts Institute of Technology will allow credit for nine units of advance study for completion of this program. The tuition fee for the complete program will be $80, and admission to the program will be in order of application. Prof. J. M. Lessells, department of mechanical engineering, Massachusetts Institute of Technology, Cambridge, Mass., is in charge of the program.

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Iowa Engineering Society Holds Semi-Centennial

"Fifty years of engineering leadership" were outlined at the Iowa Engineering Society semi-centennial in Iowa City, Mar. 10-12. Containing accounts of meetings since the first one in 1889, it was prepared by J. S. Dodds, secretary.

T. R. Agg, dean of engineering at Iowa State College, and retiring president, stated in his address that it is not a proper part of an engineering society's functions to act as bargaining agency for its members, or even to find jobs for them, except perhaps informally.

H. O. Croft, in an outstanding committee report, said that engineers will unionize unless a better bargaining agency is provided. The Minnesota Highways engineers, he said, have formed a chapter and have affiliated with C.I.O.

OBITUARY

SAMUEL E. BRADT, first highway commissioner of Illinois, died March 15 at DeKalb, Ill., aged 76. The state's hard roads program was organized under his regime, which lasted from 1917 to 1921.

CHARLES S. POPE, 63, construction engineer for the California Division of Highways since 1923, died of a heart attack in Riverside on March 15. Mr. Pope, who was stationed at Sacramento, had been advised for the past several years to remain away from field work because of his heart condition; the flood emergency conditions, however, led him to take part in a survey of the damage. Mr. Pope graduated with a degree in civil engineering from Leland Stanford University in 1897. He spent several years in various surveying and construction inspection positions, practiced privately as a surveyor, and in 1905 entered the office of the city engineer of Los Angeles, rising from the position of chief of a survey party to that of supervising engineer of street construction. In 1916 he left the city service to become engineer for the Warren Bros. Co. of Oakland, Calif.

JOHN T. DOVEY, 58, Seattle consulting engineer, died in that city March 16. Born in England, Mr. Dovey was a graduate of Philadelphia College and the University of Pennsylvania. He early began to practice his profession in the West, serving for several years as instrument man and assistant engineer for the Northern Pacific Ry., then as chief engineer of the Green River Construction Co. After several years service with railway and power companies, he became chief engineer of the Seattle and Tacoma Power Co. in 1906. He served during the war in the 18th Engineers with the rank of captain and had practiced in Seattle since his demobilization.

GEORGE C. SCALES, an engineer for the Minnesota highway department for the past seventeen years, died in Minneapolis recently at the age of 71. A graduate of the Massachusetts Institute of Technology, Mr. Scales was for some time senior highway engineer with the U. S. Bureau of Public Roads and earlier had been superintendent for the Barber Asphalt Paving Co. of New York City.

WALTER OVERSTREET, Jacksonville, Fla., civil engineer who retired about four years ago, died March 10 in Jacksonville at the age of 71. Mr. Overstreet was for many years highway engineer of Duval county, Fla.

LIEUT. COL. CHARLES E. PERRY, district engineer at Nashville for the U. S. Engineers, was drowned in the Tennessee River March 14. The accident occurred while Colonel Perry was making an unaccompanied inspection of Wheeler Dam; he is believed to have fallen from a catwalk across a lock gate. Colonel Perry entered the army in 1917 as a captain in the engineer section of the Officers Reserve Corps. He was made a major in 1918, and was recommissioned to that rank at the time of the army re-organization in 1920. He was promoted to the rank of lieutenant colonel two years ago and had been serving in Nashville for the past four years. Colonel Perry, a graduate of Yale University, spent several years in the city engineer's office at Portland, and after several years on various construction jobs, he began to practice privately in 1905 as a member of the firm of Vrooman & Perry of Gloversville and Canajoharie, N. Y.; the partnership was dissolved in 1914, and Mr. Perry opened offices in Albany.

CALENDAR OF MEETINGS

NATIONAL SOCIETIES

AMERICAN SOCIETY OF CIVIL ENGINEERS, Spring meeting, Jacksonville, Fla., April 20-23.

AMERICAN SHORE & BEACH PRESERVATION ASSOCIATION, annual meeting, Washington, D. C., April 19, and Jacksonville, Fla., April 21.

AMERICAN WATER WORKS ASSOCIATION, annual convention, Roosevelt Hotel, New Orleans, April 24-28.

REGIONAL AND LOCAL

MICHIGAN ENGINEERING SOCIETY, annual meeting, Grand Rapids, April 7-9.

CALIFORNIA SEWAGE WORKS ASSOCIATION, annual spring conference, U. S. Grant Hotel, San Diego, April 11.

GREATER NEW YORK SAFETY COUNCIL, annual convention, Hotel Astor, New York City, April 19-21.

AMERICAN SOCIETY OF CIVIL ENGINEERS, Texas Section, spring meeting, Texas State Hotel, Houston, April 29-30.

MARYLAND-DELAWARE WATER AND SEWERAGE ASSOCIATION, annual conference, Emerson Hotel, Baltimore, May 19-20.

SECTION MEETINGS, American Water Works Association:
Illinois, Decatur, April 5-6.
Indiana, West Lafayette, April 7-8.
Pacific Northwest, Spokane, May 19-21.

ELECTIONS AND ACTIVITIES

THE IOWA ENGINEERING SOCIETY elected the following officers at its annual meeting: President, A. A. Baustian; vice-presidents, H. O. Croft and O. W. Crowley; directors, J. H. Ames, L. W. Mahone and Mark Morris. Honors for meritorious papers were awarded to E. S. Joehnk and A. H. Wieters.

JOSEPH S. HELM was elected president of the Asphalt Institute at the annual meeting of the board of directors recently. Other officers elected were: James A. Blood, T. M. Martin, A. M. Maxwell, vice-presidents; Herbert Spencer, treasurer; and F. V. Widger, secretary. B. L. Boye, retiring president, was made chairman of the executive committee.

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Short Courses

REGIONAL MUNICIPAL TRAINING SCHOOL for water superintendents and water works operators of New York State Municipalities, sponsored by New York State Conference of Mayors, American Water Works Association, and Rensselaer Polytechnic Institute, Cornell University, New York University. Held April 6-8, Cornell University, Ithaca; April 13-15, New York University, New York City.

UNIVERSITY OF WISCONSIN, short course for sewage works operators, sponsored by the League of Wisconsin Municipalities at Madison, April 19-22.

TEXAS A. & M. COLLEGE, short course in highway engineering, directed by the Department of Civil Engineering of the college, in cooperation with Texas Highway Department, College Station, Tex., April 15-16.

PERSONAL

THOMAS E. HEGARTY has been appointed city engineer of Somerville, Mass. Mr. Hegarty is a graduate, 1927, of the Massachusetts Institute of Technology.

FRANK STARKWEATHER has been appointed head of the civil engineering department of the Seattle division of the U. S. Coast Guard. Mr. Starkweather has been with the Coast Guard for 12 years, lately at Washington, D. C. He will have charge of building work in Washington, Oregon and Alaska.

ISAAC N. CARTER has been appointed acting head of the department of civil engineering at the University of Idaho.

DONALD D. PRICE, former general manager and chief engineer of the Platte Valley Public Power & Irrigation District at North Platte, Nebr., has taken the position of technical engineer with the Ash Grove Lime & Portland Cement Co. of Omaha. Mr. Price was formerly connected with the Ash Grove company before taking his position with the irrigation district.

CHESTER R. BLAKELOCK, for the past 8 years contract engineer for the Long Island State Park Commission, New York State, has been made executive secretary of the commission. Mr. Blakelock was formerly with the New York State Department of Public Works as engineer on surveys and construction.

A. W. ELLSON FAWKES has been made city engineer of Moose Jaw, Sask. Mr. Fawkes has been engineer of construction for the city of Minneapolis, works engineer for Calgary, city manager and engineer of Brandon, and irrigation engineer for municipalities in the Kootenay Valley.

V. E. SCOTT has been made assistant director of highways for the Arkansas highway department.

WILLIAM A. BRENNAN has been appointed commissioner of public safety of White Plains, N. Y. Mr. Brennan, a graduate in civil engineering of New York University in 1916, was formerly deputy commissioner of the department of public safety.

LAMOTTE GROVER has been made instructor of applied mechanics at the Kansas State College of Agriculture and Applied Science. Mr. Grover has been with the bridge department of the Missouri Pacific R.R. in recent months and was formerly connected with the Kansas State Highway Commission.

GEORGE HUBER has resigned as area engineer for the WPA District at Parkersburg, W. Va.

ARTHUR R. HAHN has joined the Hanley Co. of New York City as sales engineer of face brick and ceramic products in northern New Jersey. Until recently Mr. Hahn was connected with the Portland Cement Association and for ten years previously was engaged in municipal engineering in New Jersey and railroad engineering in New York State.

COL. J. N. HODGES, U. S. Engineer, who has been division engineer of the Upper Mississippi Valley Division for the last two and a half years, left St. Louis March 1 to assume duties as engineer in charge of the Hawaiian department. He will also be in command of the Third Engineers.

LIEUT.-COL. MALCOLM ELLIOTT, who has been senior military assistant to Colonel Hodges, has assumed the duties of division engineer for the Upper Mississippi Valley Division.

MARION L. CRIST, resident engineer during construction of the Little Rock water supply, has been made engineer and public relations counsel for the Little Rock water department. Mr. Crist was resident engineer for Burns & McDonnell of Kansas City on the water supply project. He began to work for Burns & McDonnell immediately after his graduation from Leland Stanford University in 1925. He left the firm for a year in 1933 to make investigations for the Metropolitan water district of southern California on the Colorado aqueduct.

CARL A. ANDERSON, who has been in charge of the Willacy County Water Control and Irrigation District No. 1, has taken the position of chief engineer for the San Carlos Irrigation and Drainage District at Florence, Ariz.